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A SURVEY OF ABILITY AND ACHIEVEMENT OF GRADE NINE STUDENTS

IN THREE ALBERTA COUNTIES

by

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The undersigned certify that they have read, and
recommend to the Faculty of Graduate Studies for acceptance,
a thesis entitled " A Survey of Ability and Achievement of
Grade Nine Students in Three Alberta Counties " submitted by
Andrew Goroniuk in partial fulfilment of the requirements for
the degree of Master of Education.

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ABSTRACT

The purpose of this research was to investigate the ability

potential of Grade IX pupils over a ten-year period, 1959-60 to

1968-69, in three Alberta counties selected on the basis of similar

geographic, socio-economic, cultural, and demographic factors. Data

were obtained from the school transcript sheets and from student

record cards made available by the Alberta Department of Education.

Absolute changes in verbal, quantitative, and total ability as

measured by the SCAT test, as well as changes relative to the province,

were examined so that trends could be detected. Achievement in language

and in mathematics was also examined to determine whether ability

changes were reflected in achievement changes.

The findings disclosed that Grade IX pupil ability had progres-

sively changed during the ten-year interval and is approaching the

provincial average. The three counties jointly, the counties individ-

ually, and the boys and girls as separate groups within the counties

have shown similar changes. Variations were noted among the counties

as well as among the schools within one of the counties selected for

further study.

Growth in total ability can be attributed mainly to positive

changes in verbal ability which showed steady absolute gains during

the ten-year interval. A comparison with provincial standards, how-

ever, revealed sporadic changes. Quantitative ability changes also

showed positive absolute gains, but a comparison with provincial

averages revealed approximately the same potential.

Growth in verbal ability was not reflected in language achieve-

ment. Pupils within the three counties had consistently scored above their indicated verbal and quantitative capabilities in both language and mathematics respectively.

This research may offer some guidance to educational administrators within the counties surveyed in the planning of instructional programs to fit the needs of individual students. The counties as well as the Department of Education should be concerned about some of the adverse changes occurring in quantitative ability at both the county and the provincial levels.

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CHAPTER I

THE PROBLEM AND DEFINITIONS OF TERMS USED

Alberta has experienced far-reaching demographic and economic changes since its inception as a province. The rural areas have not escaped these changes and differ from the urban areas only in the direction and magnitude of change. Whereas urban areas continue to grow in population, rural areas are faced with a dwindling population (Alberta Bureau of Statistics, 1967, pp. 15-16). Whereas urban areas, in general, have been able to meet the educational needs of their students, the rural areas are finding it increasingly more difficult to meet the needs of their youth.

The consolidation of school districts, the formation of school divisions and counties, and the emergence of regional high schools are but some of the steps taken to improve the educational opportunities of rural youth. The struggle for equality with urban systems continues; nevertheless, differences still exist.

Various researchers have examined differences between rural and urban students. The majority of these studies, however, have assessed the characteristics of students at a specific time and place and have seldom been longitudinal in nature. Canadian research into rural-urban differences is also very limited with few studies being of the nature where student characteristics are examined over an extended period of time to determine whether any systematic changes have taken place.

I. STATEMENT OF THE PROBLEM

Major Problems

1. Has pupil potential, as measured by the SCAT test, undergone significant changes during the ten-year period in any of the following: (a) overall ability, (b) verbal ability, (c) quantitative ability?

2. Has pupil potential in (a) overall ability, (b) verbal ability, (c) quantitative ability undergone changes comparable to the provincial changes?

Sub-problems

1. Has male ability in the verbal and quantitative skills, as measured by the SCAT test, undergone the same changes as the female changes in the same skills?

2. Has pupil verbal ability undergone the same change as pupil quantitative ability?

3. Has pupil achievement in language and mathematics, as measured by the High School Entrance Examination, undergone signif-icant changes during the ten-year period?

4. Has pupil achievement in language and mathematics, as measured by the High School Entrance Examination, undergone changes similar to the changes in verbal and quantitative skills as measured by the SCAT test?

Importance of the Study

Alberta has witnessed a rural-to-urban population shift that has generally resulted in a corresponding decrease in school pop-ulation (Department of Education Annual Reports, 1958-67). The

dwindling school enrolments have brought about new organizational problems, problems pertaining to the staffing of the classrooms, transportation problems, and curriculum problems. The first two problems are readily noticeable and are perhaps the first to be dealt with by the school boards and administrators. The task of building a curriculum to suit the needs of the pupils, however, is not as readily undertaken nor is it as easily carried out. Difficulties may be further compounded if the rural-to-urban population shift has resulted in changes in the average pupil potential.

The findings of this study have revealed areas of change in pupil ability. Since both the actual scores and the stanines were examined, the findings have also indicated whether a particular caliber of student has been removed from the rural schools through the process of depopulation. Based on this survey, individual counties may then institute their own studies so that the organization of the school and the curriculum does in fact meet the needs of each pupil.

The SCAT results which are actually a measure of attainment of both verbal and quantitative skills that can be learned in school also indicate the relative success which the rural schools have attained over the ten-year period since the attainment of these skills is the responsibility of both the pupil and the school. Trends might then be established which would permit rural areas to anticipate problems brought about by changes and to take corrective steps at the most appropriate time.

Of general importance to all rural areas is an indication of how the rural areas compare with the provincial standards in both

ability and achievement. The absolute comparison of county results followed by a comparison with the provincial standards not only indicates whether changes in ability are significant but also indicates whether the changes are taking place in the desired direction.

Delimitation of the Study

Geographical delimitation. Ideally it would be desirable to undertake a study involving the whole rural area of Alberta. However, since the rural-to-urban movement and the centralization of schools took place at different times in different parts of the province, this study was restricted to three adjoining counties. The counties were selected on the basis of similar geographical features, population trends, and centralization proceedings.

Delimitation of time-period. The study was limited to the time interval 1959 to 1968, the period during which time the new form (SCAT) of the Grade Nine Ability Test had been used and the results issued to the schools.

Delimitation of subject areas. The study was confined to the verbal and quantitative parts of the SCAT test, and the language and mathematics High School Entrance Examination results. The language and mathematics subjects were chosen because they are logical parallels to the verbal and the quantitative parts of the SCAT test.

Assumptions

It was assumed that:

1. Ability was measured by the SCAT test; and

2. Achievement was measured by the High School Entrance

Examinations.

II. DEFINITIONS

1. <u>Overall ability</u> is that which is measured by the complete SCAT (School and College Ability Test) test which is administered to all Grade IX students by the High School Entrance Board of the Department of Education.

2. <u>Academic achievement</u> refers to the scores which a Grade IX pupil receives on the High School Entrance Examinations.

3. <u>High School Entrance Examinations</u> are those examinations prepared and administered to Grade IX pupils in the Province of Alberta by the High School Entrance Examination Board of the Department of Education.

4. <u>Grade IX examination subjects</u> are those subjects (mathematics, science, language, literature, social studies, and reading) for which a High School Entrance Examination must be written at the end of the school year.

5. <u>Rural area</u> refers to all land including towns and villages within the confines of the respective counties.

6. <u>Regional</u> refers to the three counties jointly and is used interchangeably with "three-county".

7. <u>Quantitative ability</u> is that which is measured by the quantitative sub-test of the SCAT test.

8. <u>Converted ability scores</u> are raw scores that have been equated to a common score scale in terms of American norms.

9. <u>Ability raw score</u> (verbal, quantitative, and total) refers to the number of correct responses on the SCAT test.

10. <u>Verbal ability</u> is that which is measured by the verbal sub-test of the SCAT test.

11. <u>Ability standardized scores</u> are raw scores that have been transformed on the basis of provincial means and standard deviations.

12. <u>Achievement standardized scores</u> are transmuted scores that have been transformed on the basis of provincial means and standard deviations.

13. <u>Transmuted scores</u> are raw scores that have been scaled by the Department of Education.

14. <u>Total achievement</u> is the total score that a student receives on the six Grade IX examination subjects.

15. <u>Absolute change</u> is the change in pupil ability as indicated by differences in raw scores on the same Form of the SCAT test.

CHAPTER II

REVIEW OF RELATED LITERATURE

Differences between rural-urban students have long been a
subject for study on both the North American and European continents.
Time, however, has changed the ease with which schools may be
classified as rural or urban units. Not only has urban influence been
felt in rural areas but the centralization of smaller schools into
larger units has in itself introduced urban traits into rural schools.

The transportation of rural youth to centralized schools
located in towns has permitted the school boards to offer an educational
program that is much more comparable to that offered in the urban
schools. Library, science, and audio-visual facilities have greatly
improved the teaching-learning process in the elementary and junior
high school grades. Rural senior high schools, unfortunately, continue
to be held back by small enrolments and find it increasingly more
difficult to offer an educational program suited to the needs of all
the students. Downey (1965, p. 8), for example, states that:

> Officials of the Department of Education have regularly
> expressed concern over what they perceive to be a dual
> standard of secondary education throughout the province -
> one standard for the urban areas and one for the rural.

Mass media and rapid transportation have also brought about the
exposure of rural youth to experiences which at one time were common
to urban youth only. Whether these experiences are good or bad, the
fact is that with the exception of some of the more remote areas the
rural youth of today are not the rural youth of twenty years ago.
Differences between urban and rural youth, nevertheless, still exist.

Richmond (1953, p. 7), one of the early European writers,

states that:

> Differences between the town school and the country school
> are so deep-rooted that no good purpose is served by thinking
> that the two partake of the same character as institutions. . .
> failure to acknowledge this has resulted in policies which have
> prevented the country school from developing its appropriate
> idiom.

The writer goes on to assert (p. 34) that rural schools, managed by

rural people who themselves are largely lacking in educational

insight, have with the exception of a few places practically stood

still. Difficulties are compounded by the fact that rural areas are

generally less wealthy than the urban areas and are, therefore,

unable to effectively budget for education. Differences in pupil

ability, then, are often due not to discrepancies in the intellectual

capacities of the students but to the social situation in which the

boys and girls are placed (p. 75).

Other pertinent rural-urban observations reported by Richmond

(1953, p. 135) are: (1) Rural children tend to be superior in mechanical

ability; (2) Urban children tend to be superior in verbal ability;

(3) Urban children tend to be superior in speed of performance; and

(4) We would be unjustified in saying that one group is intellectually

superior from one another. The performance should rather be evaluated

in terms of the degree to which rural-urban youth possess specific

traits and abilities. Other things, Richmond further contends, which

certainly are not equal are the home background, the school organi-

zation, and not least the quality of teaching (p. 140).

Fleming (1955) in a survey involving achievement in reading

comprehension, reading speed, arithmetic computation, arithmetic

reasoning, and spelling in different areas within the Province of

Ontario reports findings which state that achievement, with the exception of reading speed, tends to be lower on the average in rural schools than in the city schools tested. Seven factors as possible causes of low achievement were investigated but only two showed any relationship. These were the percentage of pupils transported by bus being negatively related and the teachers' qualifications being positively related with high achievement. Good achievement was also found to be positively associated with the size of the school and the close proximity of the pupils' homes to the school.

Uhlman (1959), in a study involving rural Alberta, drew three important conclusions: (1) The traditional rural-urban differentiation, as separate and discrete parts of society in Alberta, must be abandoned, particularly with regard to education; (2) New ways and means of improving the quality and scope of rural education must be sought; and (3) Financial schemes of the future must distribute the costs of education more fully than presently done so that rural youth do, in fact, have educational opportunities equal to those of their urban counterparts.

Burchinal (1961, pp. 107-121) found that the lowest levels of educational and occupational aspirations were observed in farm boys and the highest in metropolitan boys. The researcher found that planning to farm had a depressing effect on the aspirational levels of farm youth and that family influences played an important part in determining these levels. Carrol and Wheeler (1966, p. 67) also found that low attainment in the rural farm groups was common as compared to high attainment in the large urban areas. Considerable differences, moreover, between different rural non-farm populations were found.

More recently, Haller and Sewell (1967, pp. 37-55) also found that planning to farm had a depressing effect on the levels of concern with future education and is associated with lower intelligence and with lower emphasis on achievement by significant others (parents). The writers also found that if parents encourage college attendance then the boys aspired to and worked towards professional occupations, whereas if parents were indifferent to college attendance the boys commonly chose lower occupations.

Bender and others (1967, pp. 278-289), however, found that the aspiration of boys in low income areas compared favorably with those of boys in higher income areas. Low levels of aptitude were, at the same time, found to be associated with high aspirations, whereas high levels of aptitude were associated with aspirations below the capabilities of the students. The writers further report that youth are frequently migrating from low income areas in search of non-farm employment because of the paucity of local employment opportunities. This is particularly true of rural youth with high aspiration levels and abilities. Differences in capabilities among rural youth, the writers state, have frequently been attributed to differences in the quality and quantity of educational facilities and opportunities available.

Schnore (1966, pp. 131-143) developed the thesis that rural-urban divergencies in the United States are still substantial and well worth studying despite the apparent fact that they are diminishing. The writer maintains that the place of residence and the place of origin are fundamental characteristics of individuals that permit an analyst to predict human behavior. The closing gap between rural-

urban capabilities, the writer suggests, is due to the selective rural-urban migration that has had the effect of lowering the average level of intelligence at both ends of the move. The statement implies that migrants, though superior to the remaining rural youth, were in fact less intelligent than the urban dwellers.

Siemens and Driedger (1965) in a rather extensive Manitoba survey examined farm, rural non-farm, and suburban youth differences. The purpose of the research was: (1) to find out whether any significant differences exist between farm, rural non-farm, and suburban youth, (2) to isolate the variables around which the differences revolve, (3) to compare the differences with a number of U. S. A. studies to see whether Canadian and American rural-urban differences are the same, and (4) to summarize some of these variables into categories of exposure to diversity of social experience and student motivation. The researchers found that suburbanites tended to rank significantly higher than the farm youth on socio-economic status, parent education, number of schools attended, work away from home, average marks, intelligence, leadership rating, and aspirations. Rural non-farm youth in this survey attained an intermediate rank. The researchers thus suggest that the type of residence is a container or crucible in which a certain quality of factors rest. Given a farm environment, we can expect persons with different motivations, aspirations, and abilities than if they lived in the city.

The researchers also assert that United States comparisons of rural-urban youth hold true for Canadian studies. Rurality is associated with lower educational and occupational aspirations, whereas urbanization is related to higher self-concept, intellectual ability,

and economic status.

Residence was found to be significantly related to exposure to a variety of experiences. City and suburban youth are given more opportunity to learn, to see and do new things, and are therefore more highly motivated. Parents of suburban youth were themselves more highly educated with the result that interest in education was actively promoted.

Farm students were also found to be less confident of leader-ship ability. The average intelligence and high school marks were also lower than that of the suburban youth. Suburban educational and aspirational levels, moreover, were found to be higher than that of the rural counterparts.

Research would thus indicate that rural-urban differences still exist but are not perhaps as pronounced as they used to be and do vary among the different regions. Longitudinal studies, however, are scarce and no trends have been positively established from these studies.

Where previous studies had measured the capabilities of rural youth in terms of intelligence, this study evaluates the capacity of students to undertake the next higher level of schooling. The School and College Ability Test (SCAT) purports to be a measure of capacity (Cooperative Test Division, p. 5) and each of the four sub-tests in each of the SCAT forms was designed to aid in estimating the capacity of a student to undertake the next higher level of schooling. The verbal sub-tests involve comprehending the "sense" of a sentence read and attaching meaning to isolated words, whereas the quantitative sub-tests involve manipulating numbers, applying number concepts accurately in a computational situation, and solving quantitative problems.

The series of SCAT tests measures "school-learned abilities" directly rather than psychological characteristics or traits which afford indirect measurement of capacity for school learning. The decision to base the SCAT series on school-learned abilities stems from three general observations shared by all members of the Committee directly involved in the preparation of the SCAT tests. Two of these observations pertinent to this study are:

1. The best single predictor of how well a student is likely to succeed in his school work the following year is his success this year.

2. A certain few school-learned abilities such as skills in reading and in handling quantitative information appear to be critical pre-requisites to subsequent steps in learning throughout the range of general education.

CHAPTER III

RESEARCH DESIGN

I. SELECTION OF SAMPLE

This study was designed primarily to assess pupil potential,
to note the changes taking place, and to establish some trends from
the available data. The sample, or more appropriately the population,
consisted of all Grade IX pupils enrolled in three adjacent counties
during the ten-year period 1959 to 1968. These counties were selected
on the basis of similar geographic, socio-economic, cultural, and
demographic factors. The degree of school centralization as indicated
by the absence of small one and two-room schools was also taken into
consideration.

The researcher was also greatly influenced by personal
interests when making the selection of counties. This sample, there-
fore, is not representative of the total Alberta rural population
and any findings as such can only be true of counties with similar
characteristics.

The complete Grade IX enrolment within the three counties for
the ten consecutive years, 1959 to 1968, is shown in Table I. A further
break-down of the population into male and female enrolments respec-
tively in the three counties for the same ten consecutive years is
shown in Tables II and III.

II. SOURCE OF THE DATA

Both the pupil names and the SCAT raw scores were obtained

TABLE I

COUNTY TOTAL GRADE NINE ENROLMENTS BY YEARS

County	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968
1	175	169	208	200	198	185	188	168	151	155
2	152	129	128	102	119	125	124	114	122	135
3	166	160	164	169	165	161	163	167	185	144
Total	493	458	500	471	482	471	475	449	458	434

TABLE II

COUNTY MALE GRADE NINE ENROLMENTS BY YEARS

County	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968
1	74	78	106	95	89	76	100	87	76	74
2	74	60	67	50	61	57	58	57	59	60
3	93	83	78	77	86	84	82	85	92	64
Total	241	221	251	222	236	217	240	229	227	198

TABLE III

COUNTY FEMALE GRADE NINE ENROLMENTS BY YEARS

County	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968
1	101	91	102	105	109	109	88	81	75	81
2	78	69	61	52	58	68	66	57	63	75
3	73	77	86	92	79	77	81	82	93	80
Total	252	237	249	249	246	254	235	220	231	236

from the school transcript sheets. The pupil achievement transmuted

scores were acquired from the student record cards made available

by the Department of Education. Provincial means and standard devia-

tions for both the ability and achievement scores were supplied by

the Research Division, Department of Education.

III. METHOD OF ANALYSIS

Three different analyses were used:

1. A one-way analysis of variance involving an F test (Ferguson,

1966, pp. 281-7) which indicated whether overall differences were

significant, followed by the Scheffé method (Scheffé, 1964, p. 68)

which tested the significance of the differences between all possible

pairs of means. Scores analysed by this method were: (a) ability raw

scores, (b) ability converted scores, (c) ability standardized scores,

(d) language standardized scores, and (e) mathematics standardized

scores. The .05 level of significance was adopted in all cases.

2. A one-way analysis of variance (two-tailed test) with repeated

measures (Winer, 1962, pp. 110, 113, 124-132) also applied to the

ability and achievement scores but used in this case to test the

significance of difference of achievement by the same pupils on differ-

ent tests. Groups of standardized scores analysed this way were the

ability total, verbal, and quantitative; the language and the ability

verbal; the mathematics and the ability quantitative; and the language

and mathematics scores. The .05 level of significance was adopted.

3. A nonparametric goodness-of-fit test (Ferguson, 1966, pp. 191-

212) which determined the goodness of fit of a normal distribution to

the observed county stanine frequency distribution. This test was primarily used to indicate the direction of change. Stanines analysed by this method were the ability verbal, ability quantitative, language, mathematics, and total achievement.

Specifically, the treatments employed in the analysis of each of the problems were:

1. The analysis of variance, F test followed by the Scheffé Method, was used to determine whether pupil potential, as measured by the SCAT test, had undergone significant changes during the ten-year period.

2. The "goodness-of-fit" test and the one-way analysis of variance with repeated measures were used to determine whether pupil potential had undergone changes comparable to the provincial changes.

3. The analysis of variance, F test followed by the Scheffé Method, was used to determine whether pupil achievement in language and mathematics had undergone significant changes during the ten-year period.

4. The one-way analysis of variance with repeated measures was used to determine whether pupil achievement in language and mathematics, as measured by the High School Entrance Examinations, had undergone changes similar to the changes in the verbal and quantitative skills as measured by the SCAT test.

5. Graphic representations of the means were used to determine whether male ability in the verbal and quantitative skills had undergone the same general changes as the female changes in the same skills.

6. A graphic representation of the means and the one-way analysis of variance with repeated measures were used to determine whether pupil verbal ability had undergone the same change as pupil quantitative ability.

All the assumptions underlying the analysis of variance such as: (1) homogeneity of variance, (2) that the distribution of the variables in the population from which the samples were drawn are normal, and (3) that the effects of various factors on the total variations are additive were made. Originally the analysis of variance was applied to the raw scores, the converted scores, and the standard scores, but an inspection indicated that both the converted scores and the standard-ized scores consistently violated the homogeneity of variance assump-tion brought about, in part, by the large population. Since two forms, Form A and Form B, of the SCAT test were used by the province a separation of the population into two smaller groups greatly improved the homogeneity of variance but did not obscure the general trend. Consequently, separate analyses of the two forms of the SCAT test were carried out.

CHAPTER IV

RESULTS OF THE ANALYSIS

This study examined pupil ability potential as indicated by
the SCAT test and further substantiated by achievement in the
mathematics and language tests set by the High School Entrance
Examination Board. The graphs, tables, and related discussion in this
chapter represent the essential findings of this study.

I. RESULTS OF ANALYSIS: MAJOR PROBLEMS

The analysis of data indicated that absolute changes in verbal,
quantitative, and total ability have taken place during the ten-year
period involved in the study. The changes, however, were not identical
and will consequently be presented separately. Findings also indicate
that pupil ability potential, as measured by the SCAT test, is in-
creasing and approaching the provincial mean. This would suggest that
depopulation if anything would appear to have a positive effect on
rural pupil potential.

The analysis of data has revealed that converted scores based
on American norms are not a suitable basis for comparison of rural
Alberta scores. The relative difficulties of the verbal and quanti-
tative sub-tests of the SCAT test are illustrated in Figure 1.
Provincial means showed the same wide disparity.

Two forms A and B of the SCAT test were used during alternate
years and as is also illustrated in Figure 1, Form A has been gener-
ally more difficult than Form B. What is perhaps more important is

FIGURE 1

TOTAL, VERBAL, AND QUANTITATIVE COMPARISONS OF
THREE-COUNTY CONVERTED RAW SCORES, 1959-68

that any analysis based on the two forms would be systematically biased
in a direction depending upon the form first used.

Ability Potential

The analysis of variance was applied to the raw scores rather
than the converted scores. As previously stated, the conversion of the
scores did not eliminate the difference in the degree of difficulty
between the two forms of each sub-test of the SCAT test. The researcher
also found that one of the basic assumptions in the analysis of
variance, that of homogeneity of variance, was frequently violated
upon using converted scores. Furthermore, any comparison to provincial
standards had to be made in terms of raw scores since both the
provincial mean score and the standard deviations were computed from
raw scores.

Verbal ability. Composite results from the three counties on
both Form A and Form B of the SCAT test indicate significant positive
changes, at the .05 level or better, in verbal ability for all
successive even or odd years except 1966 on Form A and 1961, 1963,
1967 on Form B of the SCAT test. The mean scores on both forms of the
SCAT test for each of the five years during which the particular form
was used are given in Tables IV to VII inclusive and Figure 2.

It is important to note that Tables IV to VII and Figure 2
represent absolute comparisons of means which are not at this stage
indicative of growth in relation to American norms or Provincial
standards. The plateau between years 1964-1966, Figure 2, Form A,
is also worthy of notice in that the mean for 1966 is completely
out of step with the other means.

TABLE IV

SUMMARY OF THE ANALYSIS OF VARIANCE OF THREE-COUNTY
VERBAL RAW SCORES ON FORM A OF THE SCAT TEST

Group	Number	Mean	Variance	S. Dev.
1960	458	28.8821	116.3672	10.7874
1962	471	31.5584	95.4987	9.7723
1964	471	34.7601	111.7839	10.5728
1966	449	34.6882	109.0911	10.4447
1968	434	37.2765	117.5592	10.8425
Totals	2283	33.3846	118.0300	10.8642

$F = 43.41; \quad P = 0.1800$

TABLE V

SIGNIFICANCE MATRIX FOR SCHEFFE MULTIPLE COMPARISON
OF MEANS FOR DATA IN TABLE IV

	1960	1962	1964	1966	1968
1960		sig.	sig.	sig.	sig.
1962			sig.	sig.	sig.
1964				not sig.	sig.
1966					sig.
1968					

"sig." indicates significance at the .05 level or better
for this and all following tables within this text.

TABLE VI

SUMMARY OF THE ANALYSIS OF VARIANCE OF THREE-COUNTY
VERBAL RAW SCORES ON FORM B OF THE SCAT TEST

Group	Number	Mean	Variance	S. Dev.
1959	493	30.4828	130.6407	11.4298
1961	500	32.5380	129.7886	11.3925
1963	482	34.0062	129.4293	11.3767
1965	475	37.7832	132.9596	11.5308
1967	458	38.6507	122.3378	11.0606
Totals	2408	34.6084	138.3750	11.7633

F = 44.50;   P = 0.000008

TABLE VII

SIGNIFICANCE MATRIX FOR SCHEFFE MULTIPLE COMPARISON
OF MEANS FOR DATA IN TABLE VI

	1959	1961	1963	1965	1967
1959		not sig.	sig.	sig.	sig.
1961			not sig.	sig.	sig.
1963				sig.	sig.
1965					not sig.
1967					

FIGURE 2

THREE-COUNTY VERBAL MEAN SCORES ON
FORM A AND FORM B OF THE SCAT
TEST, 1959-1968

County 1 generally achieved higher means than the regional average, whereas County 2 scored lower than the average. County 3 more nearly approached the joint average of the three counties. Although the three counties individually varied somewhat from their common means, they all showed substantial gains in verbal ability over the ten-year interval on both forms of the SCAT test.

Within County 1, Schools 1 and 3 consistently achieved means that were greater than the three-county average, whereas School 4 generally scored below the average. The survey would thus indicate that schools within a county and counties among themselves differ in verbal ability potential. They all, nevertheless, have shown the typical pattern of change.

A complete summary of the analysis of Verbal Form A and Form B results is given in Appendix A.

Quantitative ability. Composite results from the three counties showed significant gains, at the .05 level or better, between the time interval 1962 to 1964 on Form A of the SCAT test and between the interval 1963 to 1965 on Form B of the SCAT test. Gains between other successive years during which time a particular test was used were not significant. Beginning with 1965 consecutive decreases in quantitative ability occurred; however, the only significant changes were indicated during the 1966 to 1968 time interval on Form A of the SCAT test and the 1965 to 1967 interval on Form B of the SCAT test. The changes that have taken place are illustrated in Tables VIII to XI inclusive and in Figure 3.

In summary, it appears that successive increases in the quantitative means occurred during each of the years from 1959 to 1965,

TABLE VIII

SUMMARY OF THE ANALYSIS OF VARIANCE OF THREE-COUNTY QUANTITATIVE
RAW SCORES ON FORM A OF THE SCAT TEST

Group	Number	Mean	Variance	S. Dev.
1960	458	31.6310	78.8115	8.8776
1962	471	33.0573	74.4211	8.6268
1964	471	35.1210	68.1368	8.2545
1966	449	33.9376	76.8670	8.7102
1968	434	29.4816	81.3645	8.9585
Totals	2283	32.6903	75.6502	8.6978

$F = 27.50; \quad P = 0.000007$

TABLE IX

SIGNIFICANCE MATRIX FOR SCHEFFE MULTIPLE COMPARISON
OF MEANS FOR DATA IN TABLE VIII

	1960	1962	1964	1966	1968
1960		not sig.	sig.	sig.	sig.
1962			sig.	not sig.	sig.
1964				not sig.	sig.
1966					sig.
1968					

TABLE X

SUMMARY OF THE ANALYSIS OF VARIANCE OF THREE-COUNTY QUANTITATIVE
RAW SCORES ON FORM B OF THE SCAT TEST

Group	Number	Mean	Variance	S. Dev.
1959	493	32.7180	78.4839	8.8591
1961	500	32.8280	76.4964	8.7462
1963	482	33.8112	67.2474	8.2004
1965	475	35.7284	72.9124	8.5389
1967	458	33.6943	94.1956	9.7054
Totals	2408	33.7392	78.7173	8.8723

$F = 9.04$; $P = 0.000056$

TABLE XI

SIGNIFICANCE MATRIX FOR SCHEFFE MULTIPLE COMPARISON
OF MEANS FOR DATA IN TABLE X

	1959	1961	1963	1965	1967
1959		not sig.	not sig.	sig.	not sig.
1961			not sig.	sig.	not sig.
1963				sig.	not sig.
1965					sig.
1967					

FIGURE 3

THREE-COUNTY QUANTITATIVE MEAN SCORES
ON FORM A AND FORM B OF THE SCAT
TEST, 1959-1968

followed by substantial decreases during each of the years in the 1966 to 1968 time interval.

Individually, the counties varied from their joint mean scores but all showed the typical increase followed by a substantial decrease. County 3 attained larger mean scores than the average for the three counties, whereas County 2 achieved lower mean scores than the three-county average.

The mean scores for the three individual schools within County 1 fluctuated about the three-county average but appeared to follow the general trend. School 3 showed the least decrease in the mean scores following 1965.

A complete summary of the analysis of quantitative Form A and B results is given in Appendix B.

Total ability. The collective results from the three counties showed significant increases, at the .05 level or better, for the years 1962 and 1964 on Form A of the SCAT test. Substantial increases between odd years up to 1965 were also noted on Form B of the SCAT test but because the homogeneity of variance critical probability level was exceeded and as non-parametric tests were not used, the researcher can only speculate on the basis of Form A results that the differences occurring during the time intervals 1959 to 1963 and 1963 to 1965 were also significant. A slight drop in the total mean score was noticed following 1965. Results from both forms of the test indicated insig-nificant decreases following the last increase. The changes that have occurred are illustrated in Tables XII and XIII, and in Figure 4.

The composite totals of the verbal and quantitative scores

TABLE XII

SUMMARY OF THE ANALYSIS OF VARIANCE OF THREE-COUNTY
TOTAL RAW SCORES ON FORM A OF THE SCAT TEST

Group	Number	Mean	Variance	S. Dev.
1960	458	60.4716	308.2952	17.5583
1962	471	64.6030	258.6084	16.0813
1964	471	69.8981	281.7275	16.7847
1966	449	68.6258	294.6272	17.1647
1968	434	66.7604	306.8321	17.5249

$F = 21.42$; $P = 0.000026$

TABLE XIII

SIGNIFICANCE MATRIX FOR SCHEFFE MULTIPLE COMPARISON
OF MEANS FOR DATA IN TABLE XII

	1960	1962	1964	1966	1968
1960		sig.	sig.	sig.	sig.
1962			sig.	sig.	not sig.
1964				not sig.	not sig.
1966					not sig.
1968					

FIGURE 4

THREE-COUNTY TOTAL MEAN SCORES ON
FORM A AND FORM B OF THE SCAT
TEST, 1959-1968

noticeably separated the three counties in terms of total ability.
County 1 generally attained the highest mean scores, whereas County 2
almost consistently scored below that of the other two counties. Table
XIV illustrates the attainments of the individual counties relative to
the three-county average.

TABLE XIV

ABILITY ATTAINMENTS OF THE INDIVIDUAL COUNTIES RELATIVE
TO THE THREE-COUNTY AVERAGE

	County 1	County 2	County 3
Verbal	above	below	average
Quantitative	average	below	slightly above
Total	above	below	average

Significant increases in the means of the total SCAT scores
occurred during the interval 1959 to 1965. This would be expected,
since both the verbal and the quantitative means had shown increases
during this period. The interval following 1965 does not show any
significant changes, because, whereas the quantitative scores had
begun to show substantial decreases, the verbal scores had continued
to increase. The total ability results are summarized in Appendix C.

A Comparison with the Province

Three different analyses were employed to compare the regional
ability potential with the province-wide ability potential: (1) a
comparison of the mean raw scores which indicated both county

and provincial changes in an absolute sense, (2) a comparison of means
of standardized raw scores which more directly illustrated county
changes relative to the province, and (3) a graphic representation of
normal distributions which supplied added information in that this
method indicated the frequency distribution (on a nine-point scale)
of ability scores in comparison with the province. A limitation of
the standardized scores is that the provincial standardized mean
score assumes an unchanging value of zero.

Verbal ability. A comparison of the county raw scores with the
provincial raw scores indicates that both have shown increases in
verbal ability; however, the positive changes experienced by the
counties have taken place at a more rapid pace than that of the
province. The provincial averages, furthermore, appear to be level-
ling off, whereas the outlook for the counties is for continued
gains. Figures 5 and 6 illustrate the comparative changes in verbal
ability as measured by both forms of the SCAT test.

The standardized verbal scores also indicate that the mean
scores attained by the counties are approaching the provincial means.
The growth, apparently, seems to take place in spurts as is illus-
trated in Figure 7. The two clusters of mean scores for the years
1959 to 1963 and 1964 to 1967 are most obvious in the composite
results for the three counties. Individually, County 1 and to some
extent County 2 show the same pattern of change.

The collapsing of the ten-year interval into five periods
through the process of averaging the results of two successive years
beginning with 1959 more clearly indicates that county means are

FIGURE 5

PROVINCIAL AND THREE-COUNTY VERBAL RAW SCORE
MEANS COMPARED, FORM A SCAT TEST
1959-1968

FIGURE 6

PROVINCIAL AND THREE-COUNTY VERBAL RAW SCORE
MEANS COMPARED, FORM B SCAT TEST
1959-1968

FIGURE 7

THREE-COUNTY VERBAL STANDARDIZED MEAN SCORES,
SCAT TEST, 1959 - 1968

approaching the provincial means. Table XV illustrates the positive

changes that have taken place.

TABLE XV

VERBAL MEAN SCORES OBTAINED BY AVERAGING THE THREE-COUNTY
RESULTS OF TWO SUCCESSIVE YEARS BEGINNING WITH 1959[a]

Year	3-County	County 1	County 2	County 3
1959+1960	-.6349	-.6215	-.7345	-.5600
1961+1962	-.6209	-.5610	-.8614	-.5228
1963+1964	-.5214	-.4351	-.5567	-.5940
1965+1966	-.4242	-.3142	-.4392	-.5257
1967+1968	-.2956	-.1631	-.3530	-.3736

[a]The provincial mean in this table and in all following
tables within this text is zero.

The changes in county verbal ability are also portrayed by

superimposing the frequency distributions of stanines for three

years (1959, 1964, and 1968) onto the provincial normal distri-

bution. The representation indicates a gradual positive change in the

distribution of stanines with the relative overabundance of 1 to 4

stanines being replaced by the 5 to 9 stanines. Figure 8 illustrates

these changes.

Quantitative ability. A comparison of the three-county raw

score means with the provincial raw score means indicates no con-

sistent systematic differences between the two. Both county and

provincial means have shown increases prior to 1965 followed by

FIGURE 8

FREQUENCY DISTRIBUTIONS OF THREE-COUNTY VERBAL
STANINES IN COMPARISON WITH THE PROVINCIAL
NORMAL DISTRIBUTION - 1959, 1964, 1968

substantial decreases during the subsequent three years. The results are given in Table XVI below and by Figures 9 and 10.

TABLE XVI

THREE-COUNTY AND PROVINCIAL QUANTITATIVE RAW SCORE MEANS

| | FORM A | | | FORM B | |
Year	3-County	Provincial	Year	3-County	Provincial
1960	31.6310	32.37	1959	32.7180	32.40
1962	33.0573	33.26	1961	32.8280	33.87
1964	35.1210	33.96	1963	33.8112	34.42
1966	33.9376	33.59	1965	35.7284	35.18
1968	29.4816	30.01	1967	33.6943	33.92

A comparison of the three-county with the provincial quantitative ability by means of standardized scores revealed that the three-county region as well as the individual counties, with the exception of County 2, have done about as well on the quantitative sections of the SCAT test as has the province. Cycles, however, seem to be indicated at both the three-county and the individual county levels. Table XVII illustrates the respective quantitative ability levels of the individual counties.

Total ability. The absolute change in total ability reflects both the changes in quantitative and verbal ability; consequently, the positive changes are greater and the negative changes are smaller than

FIGURE 9

PROVINCIAL AND THREE-COUNTY QUANTITATIVE RAW SCORE
MEANS COMPARED, FORM B SCAT TEST
1959 - 1968

FIGURE 10

PROVINCIAL AND THREE-COUNTY QUANTITATIVE RAW SCORE
MEANS COMPARED, FORM A SCAT TEST
1959 - 1968

TABLE XVII

COUNTY MEANS OF STANDARDIZED QUANTITATIVE SCORES
1959 - 1968

Year	3-County	County 1	County 2	County 3
1959	0.0364	-0.0425	-0.1302	0.2723
1960	-0.0849	-0.1017	-0.3437	0.1414
1961	-0.1217	-0.1404	-0.4630	0.1683
1962	-0.0233	-0.0339	-0.3556	0.1898
1963	-0.0713	-0.1686	-0.1200	0.0807
1964	0.1327	0.2511	-0.0768	0.1593
1965	0.0644	0.2089	-0.1775	0.0819
1966	0.0395	0.2996	-0.2385	-0.0323
1967	-0.0263	0.1411	-0.2359	-0.0247
1968	-0.0597	0.0047	-0.1643	-0.0309

either of the verbal or quantitative changes. Both the three-county and the provincial total ability mean scores follow the same general pattern but the differences between the three-county and the provincial mean scores have been successively reduced to a point where the use of significance levels would indicate no significant difference. Caution, in this case, is in order since both the size of the population surveyed as well as the established trend would suggest that any consistent differences over a long period of time are significant even if these are reduced to a level where a survey involving one year only might indicate no significant difference. Figures 11 and 12 illustrate both the provincial and the county changes.

A graphic representation of standardized scores indicates the same clustering that was evident in the verbal standardized scores but much more pronounced. A substantial increase in total ability seems to take place every fifth year followed by four years of relatively little change. Again, these changes are in relation to the provincial total ability maintaining a mean of zero. Figure 13 illustrates both the clustering and the general trend assumed by the total ability scores for the region.

The averaging of the standardized total ability scores for each of the two consecutive years beginning with 1959 more clearly indicates the general trend. The three counties jointly, as well as County 1 and County 2, have shown substantial increases in total ability and appear to be approaching the provincial mean. County 3 has not described the same obvious trend established by the other two counties because of the initial remarkably high quantitative ability averages occurring during the years 1959 to 1962 inclusive. The following years sub-

FIGURE 11

PROVINCIAL AND THREE-COUNTY TOTAL ABILITY RAW
SCORE MEANS COMPARED, FORM A SCAT
TEST, 1959 - 1968

FIGURE 12

PROVINCIAL AND THREE-COUNTY TOTAL ABILITY RAW
SCORE MEANS COMPARED, FORM B SCAT
TEST, 1959 - 1968

FIGURE 13

THREE-COUNTY TOTAL ABILITY STANDARDIZED SCORES
1959 - 1968

sequently showed successive large decreases. These had a minimizing

effect on the positive verbal ability change. Both the three-county

and the individual county pupil ability potential relative to the

province are illustrated in Table XVIII below.

TABLE XVIII

TOTAL ABILITY MEAN SCORES OBTAINED BY AVERAGING STANDARDIZED SCORES
OF EACH OF TWO SUCCESSIVE YEARS BEGINNING WITH 1959

Year	3-County	County 1	County 2	County 3
1959+1960	-.4341	-.4307	-.5826	-.2507
1961+1962	-.4274	-.3971	-.7452	-.2405
1963+1964	-.3224	-.2635	-.4085	-.3233
1965+1966	-.2380	-.0658	-.3856	-.3117
1967+1968	-.1842	-.0223	-.3313	-.2572

II. RESULTS OF ANALYSIS: SUB-PROBLEMS

Male and Female Ability Compared

Both forms of the SCAT test indicate that the ability potential

(verbal, quantitative, and total) of boys and girls in the region

surveyed are generally similar to each other. Nevertheless, the girls

out-scored the boys on the verbal sub-sections on Form A of the SCAT

test with the subsequent result that this is reflected in the total

ability score. Table XIX illustrates the mean scores attained by both

TABLE XIX

RAW MEAN SCORES OBTAINED ON THE SCAT TEST BY
THREE-COUNTY BOYS AND GIRLS

FORM A

Year	Verbal		Quantitative		Total	
	Boys	Girls	Boys	Girls	Boys	Girls
1960	27.8	29.9	31.7	31.6	59.4	61.4
1962	30.3	32.7	32.5	33.5	62.8	66.2
1964	34.2	35.2	35.0	35.2	69.3	70.4
1966	34.3	35.1	34.0	33.9	68.3	69.0
1968	36.4	38.0	29.3	29.7	65.7	67.7

FORM B

Year	Verbal		Quantitative		Total	
	Boys	Girls	Boys	Girls	Boys	Girls
1959	30.3	30.7	32.8	32.6	63.2	63.2
1961	31.7	33.4	32.4	33.3	64.0	66.6
1963	34.3	33.7	33.8	33.9	68.1	67.6
1965	37.5	38.1	36.1	35.3	73.5	73.4
1967	38.6	38.7	34.2	33.2	72.8	71.9

boys and girls during the ten-year interval.

Inspection of the odd and even years under the Verbal, Quantitative, and Total Ability headings revealed that both boys and girls have followed the typical patterns set by the region.

Verbal Ability and Quantitative Ability Compared

The one-way analysis of variance with repeated measures applied to standardized scores revealed that the region generally, as well as both boys and girls as separate groups within the region, had achieved significantly better on quantitative sub-tests of the SCAT test than on verbal sub-tests during each of the years surveyed. A trend, moreover, appears to have been established as both the boys and girls as separate groups, and the region as a whole, are apparently headed towards equal verbal and quantitative abilities relative to the province. The F ratios have shown a continual decrease to a point where probabilities at the 0.001 level begin to appear. Tables XX, XXI, and XXII summarize the findings.

Achievement in Language and Mathematics

Contrary to what might be expected because of the trend established by the verbal and quantitative ability scores, the achievement in language and mathematics did not follow the pattern set by their respective verbal and quantitative counterparts. Achievement in both these subject areas generally showed irregular gains and losses that more closely resembled cycles of short duration rather than the systematic gains shown in the verbal and quantitative sub-tests of the SCAT test.

TABLE XX

SUMMARY OF ONE-WAY ANALYSIS OF VARIANCE WITH REPEATED
MEASURES OF THREE-COUNTY VERBAL, QUANTITATIVE,
AND TOTAL STANDARDIZED SCORES, 1959-68

Year	Verbal $\overline{X}$	Quantitative $\overline{X}$	Total $\overline{X}$	F	Prob. of F
1959	-0.6441	0.0364	-0.3874	303.65	0.00000
1960	-0.6258	-0.0849	-0.4408	167.03	0.00000
1961	-0.6455	-0.1217	-0.4724	165.72	0.00000
1962	-0.5964	-0.0233	-0.3825	178.04	0.00000
1963	-0.6356	-0.0713	-0.4320	188.26	0.00000
1964	-0.4073	0.1327	-0.2129	174.23	0.00000
1965	-0.3907	0.0644	-0.2185	122.04	0.00000
1966	-0.4579	0.0395	-0.2575	139.43	0.00000
1967	-0.3755	-0.0263	-0.1777	15.76	0.00008
1968	-0.2158	-0.0597	-0.1908	14.84	0.00014

TABLE XXI

SUMMARY OF ONE-WAY ANALYSIS OF VARIANCE WITH REPEATED
MEASURES OF THREE-COUNTY BOYS' VERBAL, QUANTITATIVE,
AND TOTAL STANDARDIZED SCORES, 1959-1968

Year	Verbal $\overline{X}$	Quantitative $\overline{X}$	Total $\overline{X}$	F	Prob. of F
1959	-0.6626	0.0540	-0.3885	156.22	0.00000
1960	-0.7252	-0.0774	-0.5000	111.30	0.00000
1961	-0.7188	-0.1747	-0.5447	95.39	0.00000
1962	-0.7151	-0.0842	-0.4858	90.13	0.00000
1963	-0.6052	-0.0785	-0.4189	71.27	0.00000
1964	-0.4559	-0.1236	-0.2465	82.28	0.00000
1965	-0.4185	0.1120	-0.2163	83.33	0.00000
1966	-0.4959	0.0421	-0.2792	78.50	0.00000
1967	-0.3776	0.0334	-0.0850	6.30	0.00202
1968	-0.2995	-0.0839	-0.2569	12.73	0.00045

TABLE XXII

SUMMARY OF ONE-WAY ANALYSIS OF VARIANCE WITH REPEATED MEASURES
OF THREE-COUNTY (GIRLS) VERBAL, QUANTITATIVE, AND TOTAL
STANDARDIZED SCORES, 1959 - 1968

Year	Verbal $\overline{X}$	Quantitative $\overline{X}$	Total $\overline{X}$	F	Prob. of F
1959	-0.6264	0.0196	-0.3863	147.32	0.00000
1960	-0.5331	-0.0920	-0.3857	61.01	0.00000
1961	-0.5716	-0.0683	-0.3994	71.72	0.00000
1962	-0.4906	0.0310	-0.2904	88.30	0.00000
1963	-0.6648	-0.0644	-0.4446	123.78	0.00000
1964	-0.3659	0.1405	-0.1843	92.20	0.00000
1965	-0.3623	0.0158	-0.2207	42.35	0.00000
1966	-0.4183	0.0368	-0.2349	60.96	0.00000
1967	-0.3736	-0.0849	-0.2688	27.27	0.00000
1968	-0.1457	-0.0394	-0.1353	3.90	0.02083

Achievement in language. The pupils within the three counties jointly achieved a ten-year standardized mean of 0.0037 in language which only slightly exceeded the provincial average. The girls consistently out-scored the boys by a goodly margin realizing a grand mean score of 0.2430 as compared to -0.2501 for the boys. Individual counties also showed wide variation in achievement with County 1 almost consistently achieving above ($\bar{X}$ = 0.1866) and County 2 below ($\bar{X}$ = -0.2398) the provincial averages. County 3 much more closely approached the provincial averages. Table XXIII summarizes language achievement.

Achievement in mathematics. Attainment in mathematics also showed the same irregular pattern described by the language scores. Relative to the province, the county pupils exceeded the provincial mathematics averages much more consistently and to a greater degree than was evident in language achievement. Both boys and girls within the counties achieved generally similar grand mean scores of 0.0488 and 0.0888 respectively. County 2 again consistently scored below the provincial and the regional means. Table XXIV summarizes mathematics achievement.

Achievement and Ability Compared

Language achievement and verbal ability. The pupils within the three counties had consistently and significantly scored better on the language tests than on the verbal ability sub-tests of the SCAT test. It would appear that the consistent improvement in verbal ability has had little or no direct effect on language achievement although the

TABLE XXIII

COUNTY LANGUAGE STANDARDIZED MEAN SCORES
1959 - 1968

Year	3-County	3-County Boys	3-County Girls	County 1	County 2	County 3
1959	0.0168	-0.2268	0.2485	0.2738	-0.2684	0.0045
1960	-0.0791	-0.4278	0.2444	0.2906	-0.4921	-0.1376
1961	-0.1702	-0.4075	0.0741	-0.0372	-0.5471	-0.0421
1962	-0.0415	-0.3234	0.2084	0.1234	-0.3781	-0.0305
1963	-0.1180	-0.3623	0.1144	-0.0787	-0.2209	-0.0931
1964	0.1173	-0.1467	0.3414	0.3617	-0.2002	0.0797
1965	0.1796	-0.0238	0.3813	0.2141	0.0621	0.2310
1966	0.0667	-0.1813	0.3276	0.4089	-0.1237	-0.1549
1967	-0.0490	-0.2380	0.1325	0.1946	-0.2154	-0.1376
1968	0.1389	-0.1338	0.3687	0.2030	-0.0182	0.2177
Means	0.0037	-0.2501	0.2430	0.1866	-0.2398	-0.0107

TABLE XXIV

COUNTY MATHEMATICS STANDARDIZED MEAN SCORES
1959 - 1968

Year	3-County	3-County Boys	3-County Girls	County 1	County 2	County 3
1959	0.1415	0.1530	0.1306	0.0738	-0.1426	0.4793
1960	0.0037	-0.0243	0.0296	0.0807	-0.4343	0.2727
1961	-0.1199	-0.1199	-0.1199	-0.2158	-0.6911	0.4601
1962	0.0668	-0.0117	0.1364	-0.0624	-0.1614	0.3540
1963	-0.0407	-0.0590	-0.0232	-0.2921	-0.0417	0.2573
1964	0.1468	0.1312	0.1601	0.2744	-0.0750	0.1702
1965	0.2035	0.1829	0.2239	0.3247	-0.0085	0.2306
1966	0.1734	0.1567	0.1910	0.4794	-0.0608	0.0180
1967	0.1135	0.2035	0.0271	0.2727	-0.0443	0.0883
1968	0.0217	-0.1226	0.1433	-0.0368	-0.0751	0.1764
Mean	0.0694	0.0488	0.0888	0.0760	-0.1769	0.2497

magnitude of difference between the means of the two has somewhat though not systematically been reduced. Table XXV summarizes the differences between language achievement and verbal ability as measured by the SCAT test.

Mathematics achievement and quantitative ability. Differences between mathematics achievement and quantitative ability were not as pronounced as were the differences between language achievement and verbal ability. As in the language-verbal comparison, the students scored higher on the High School Entrance Examinations in mathematics than on the quantitative sub-tests of the SCAT test. These differences were, however, significant during only six of the ten years surveyed. Also worthy of notice are the increases and decreases in quantitative ability accompanied by respective increases and decreases in mathematics achievement. Table XXVI summarizes the mathematics achievement and quantitative ability differences.

TABLE XXV

THREE-COUNTY STANDARDIZED LANGUAGE ACHIEVEMENT AND VERBAL
ABILITY COMPARED, 1959 - 1968[a]

Year	Language $\bar{X}_1$	Verbal $\bar{X}_2$	F	P	$\bar{X}_1 - \bar{X}_2$
1959	0.0168	-0.6402	381.6135	0.00000	0.6570
1960	-0.0791	-0.6216	177.1005	0.00000	0.5425
1961	-0.1702	-0.6582	222.6452	0.00000	0.4880
1962	-0.0415	-0.6016	272.6951	0.00000	0.5601
1963	-0.1189	-0.6333	224.8737	0.00000	0.5144
1964	0.1173	-0.4030	189.6696	0.00000	0.5203
1965	0.1796	-0.3858	237.5490	0.00000	0.5654
1966	0.0667	-0.4509	175.9029	0.00000	0.5176
1967	-0.0490	-0.3747	84.6220	0.00000	0.3357
1968	0.1389	-0.2169	100.5542	0.00000	0.3558

[a] A one-way analysis of variance with repeated measures was used.

TABLE XXVI

THREE-COUNTY STANDARDIZED MATHEMATICS ACHIEVEMENT AND QUANTITATIVE
ABILITY COMPARED, 1959 - 1968[a]

Year	Math. $\overline{X}_1$	Quant. $\overline{X}_2$	F	P	$\overline{X}_1 - \overline{X}_2$
1959	0.1415	0.0442	16.1483	0.0001	0.0973
1960	0.0037	-0.0760	7.6918	0.0058	0.0797
1961	-0.1199	-0.1358	0.3003	0.5844	0.0159
1962	0.0668	-0.0222	9.9733	0.0017	0.0890
1963	-0.0402	-0.0629	0.5932	0.4417	0.0227
1964	0.1468	0.1319	0.2719	0.6027	0.0149
1965	0.2035	0.0657	19.8012	0.0000	0.1378
1966	0.1734	0.0393	16.7672	0.7674	0.1341
1967	0.1135	-0.0233	20.3579	0.0000	0.1368
1968	0.0230	-0.0597	6.2107	0.0131	0.0827

[a] A one-way analysis of variance with repeated measures was
used.

CHAPTER V

SUMMARY OF FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

I. RESTATEMENT OF THE PROBLEM

The primary purpose of this study was to determine whether Grade IX pupil ability, as measured by the SCAT test, had undergone systematic changes during the ten-year interval, 1959 to 1968. Absolute changes in verbal, quantitative, and total ability as well as changes relative to the province were examined so that trends could be detected. Achievements in language and mathematics were also examined to determine whether ability changes were reflected in achievement changes.

The population consisted of all Grade IX students within a three-county area for the time interval 1959 to 1968. A total of 4,691 individual records were analysed and all pertinent information was transferred in stages onto a computer tape.

II. SUMMARY OF FINDINGS

Major problems. This study disclosed the following significant findings:

1. Three-county verbal ability, as measured by the SCAT test, has shown successive absolute increases during the 1959 to 1968 time interval.

2. Province-wide pupil verbal ability has shown absolute changes similar to those taking place within the counties.

3. Three-county pupil verbal ability has increased more rapidly

than the province-wide pupil verbal ability.

4. The difference between province-wide pupil verbal ability and three-county pupil verbal ability, as measured by the SCAT test, has been greatly reduced.

5. Three-county pupil quantitative ability, as measured by the SCAT test, has shown positive absolute changes for the years 1959 to 1965 followed by three consecutive decreases during the years 1966 to 1968.

6. Province-wide pupil quantitative ability has shown changes similar to those taking place within the counties.

7. Three-county pupil quantitative ability, as measured by the SCAT test, has not greatly differed from the province-wide pupil quantitative ability and has fluctuated about the provincial mean.

8. The three-county total ability reflects both the verbal and quantitative changes and has consequently shown compounded increases for the years 1959 to 1965 followed by attenuated negative changes during each of the subsequent three years involved in the study.

9. The three-county total ability, as measured by the SCAT test, appears to be approaching the provincial mean.

10. The three-county total ability changes relative to the province have not taken place in a continuous systematic fashion but rather in spurts every fifth year followed by four years of relative-ly little change.

Minor problems. The following significant findings have been disclosed:

1. The ability potential (verbal, quantitative, and total) of both

boys and girls in the three counties has shown similar changes.

2. The girls in the three counties have tended to show greater verbal ability than the boys. This has resulted in the girls' total ability scores being consistently greater than that of the boys.

3. Both boys and girls within the three counties possess about the same quantitative abilities.

4. The pupils within the three counties as well as both boys and girls as individual groups have shown greater quantitative than verbal ability potential.

5. Both boys and girls as separate groups as well as the three-county region as a whole appear to be headed toward equal verbal and quantitative abilities.

6. Verbal ability growth was not reflected in language achievement. Whereas verbal ability mean scores showed significant continuous gains, language achievement fluctuated about the provincial mean and described short-term cycles.

7. The pupils within the three counties had consistently scored better on the language examinations than on the verbal ability sub-tests of the SCAT test.

8. The girls within the three counties had consistently out-scored the boys in language achievement. This is perhaps due to the differ-ences in verbal ability potential.

9. Quantitative ability changes were much more closely reflected in mathematics achievement with gains and losses in mathematics achievement being almost consistently paralleled by respective changes in quantitative potential.

10. A disturbing finding, as far as the three counties are largely

concerned, is the noticeable decline and perhaps a trend towards both lower quantitative ability and mathematics achievement within the counties as compared to provincial standards.

Other findings. This study also disclosed the following related findings:

1. Form A and Form B of the SCAT test are not of the same degree of difficulty as experienced by the pupils within the three counties. Form A has been consistently more difficult.

2. A comparison of county verbal and quantitative abilities as interpreted from converted scores based on American norms is rather meaningless. Pupils have consistently shown far greater quantitative than verbal ability potential. Alberta norms need to be established if any meaningful comparisons are to be made.

III. CONCLUSIONS AND DISCUSSION

This study attempted to determine whether there were any significant changes in the ability potential of pupils attending Grade IX classes in schools within three counties. Several significant findings and certain trends have been disclosed which may prove to be worthy of consideration in the planning of instructional programs within the counties.

In Relation to Verbal Ability

1. The verbal ability potential shows a definite trend towards approaching the provincial average.

Results of the study indicate that not only have both the

province and the counties shown significant gains in verbal ability potential but that the three-county gains have been more rapid than the provincial gains. Since the ratio of boys to girls did not systematically change in the ten-year period within the counties as did the verbal scores, the study would suggest that either a better quality of teaching is taking place in these rural areas or that the student is now more receptive to verbal instruction. It is also possible that with the ready availability of mass media the experiences indirectly shared by the rural students more nearly approach those of the urban students with the subsequent result that rural youth are now beginning to attain their respective verbal potentials. The other likely explanation for the apparent convergence of the verbal capabilities of the rural and urban students is that both the home and the school in the rural areas are placing increasingly more emphasis on the importance of education.

The four possible explanations do not, however, all adequately account for the lack of consistency between the language and the verbal scores. Whereas the verbal scores had continued to show positive gains during the ten-year interval, the language achievement had fluctuated about the provincial mean. This would strongly suggest, then, that the verbal skills were not learned at school but rather through other experiences outside of school.

In Relation to Quantitative Ability

1. The provincial and the county averages indicate that the quantitative ability potential of both is about the same.
2. Both the province and the counties have shown significant

<u>positive gains in quantitative ability followed by three</u>

<u>successive decreases</u>.

The study indicates that the students within the three counties and within the province as a whole have approximately equal quantitative ability. Both have shown positive gains followed by some drastic decreases. The researcher can only speculate as to the possible reasons for the increases in quantitative ability since factors other than the school have much less influence here than in determining verbal ability.

The three successive decreases should be carefully noted. If the SCAT test does, in fact, estimate the capacity for learning through a measurement of school-learned skills, then the noted decreases would suggest that certain skills are no longer being learned. The introduction of the new mathematics program in 1965-66 in Grade VII, followed by similar programs in Grade VIII and IX during subsequent years, could have affected the 1968 results only, but would have had no effect on the two prior years during which time decreases in quantitative ability had been observed. An inspection of pupil answer sheets to determine what skills are no longer being attained might prove worthwhile.

IV. RECOMMENDATIONS AND IMPLICATIONS

The findings disclosed by this study are primarily of interest to the three counties involved although the provincial trends revealed should be worthy of consideration by all educational administrators. Possible explanations for the decrease in quantitative ability should

be examined so that we can be assured that useful skills are not being neglected.

Inference from these findings within the three counties to other rural areas should be done with caution only since the study did not involve a representative sample of the total rural Alberta school population. Other counties should examine their own pupil ability and achievement so that suitable instructional programs may be planned.

Schools within the three counties involved in this study should institute their own survey of pupil ability and achievement in Grade IX and compare the results with the three-county averages. This study has revealed some wide variations among the counties as well as among schools within one of the counties selected for further study. Effective instructional programs should be instituted so that wide disparities in learned skills do not exist.

Continuing evaluation of county results for the subsequent years is strongly suggested. Trends established may then be more fully sub-stantiated with gross deviations carefully noted so that appropriate corrective steps, if deemed necessary, may be taken.

V. SUGGESTIONS FOR FURTHER RESEARCH AND CONCLUDING STATEMENT

This research has revealed that changes in pupil ability within three Alberta counties have taken place over the ten-year interval 1959 to 1968. Findings, though not directly applicable to the whole province, do pose several questions and possibilities for further research:

1. A study similar to this one but involving a representative

sample of the total rural Alberta Grade IX school population. This study would determine whether ability changes within the three counties are typical of province-wide changes.

2. A study investigating the factors influencing and perhaps responsible for the changes taking place. Socio-economic status, aspirations of youth, family influence, and the quantity and quality of educational facilities and opportunities available are but some of the possible areas of investigation. Reasons for the variations in pupil ability among the counties as well as among schools within the counties might also be revealed.

3. A study investigating the causes of the apparent "spurts" in ability growth that have taken place relative to the provincial averages. These accelerated increases occurring during every fourth and fifth years in verbal and total ability respectively have been graphically represented and are illustrated by clusters of mean scores.

This study of the ability and achievement of Grade IX pupils has revealed that changes favorable to the three counties have taken place during the 1959 to 1968 time interval. Trends, both province-wide and within the three counties, have been established indicating that pupil ability within the three counties is approaching the provincial average. The study has, moreover, raised the question of factors influencing these changes and whether these factors are controllable. Further and continuing examination of Grade IX ability and achievement results is suggested.

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BIBLIOGRAPHY

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APPENDICES

A P P E N D I X   A

(Tables XXVII - L)

ANALYSIS OF VARIANCE OF VERBAL RAW SCORES OF THE SCAT TEST

TABLE XXVII

SUMMARY OF THE ANALYSIS OF VARIANCE OF THREE-COUNTY
VERBAL RAW SCORES ON FORM A OF THE SCAT TEST

Group	Number	Mean	Variance	S. Dev.
1960	458	28.8821	116.3672	10.7874
1962	471	31.5584	95.4987	9.7723
1964	471	34.7601	111.7839	10.5728
1966	449	34.6882	109.0911	10.4447
1968	434	37.2765	117.5592	10.8425
Totals	2283	33.3846	118.0300	10.8642

Homogeneity of Variance Test CHISQ = 6.2679; P = 0.1800

F = 43.41; P = 0.000010

TABLE XXVIII

PROBABILITY MATRIX FOR SCHEFFE MULTIPLE COMPARISON
OF MEANS FOR DATA IN TABLE XXVII

	1960	1962	1964	1966	1968
1960	1.0000	0.0046	0.0000	0.0000	0.0000
1962		1.0000	0.0000	0.0005	0.0000
1964			1.0000	1.0000	0.0114
1966				1.0000	0.0094
1968					1.0000

TABLE XXIX

SUMMARY OF THE ANALYSIS OF VARIANCE OF THREE-COUNTY
VERBAL RAW SCORES ON FORM B OF THE SCAT TEST

Group	Number	Mean	Variance	S. Dev.
1959	493	30.4828	130.6407	11.4298
1961	500	32.5380	129.7886	11.3925
1963	482	34.0062	129.4293	11.3767
1965	475	37.7832	132.9596	11.5308
1967	458	38.6507	122.3378	11.0606
Totals	2408	34.6084	138.3750	11.7633

Homogeneity of Variance Test CHISQ = 0.9055; P = 0.9238

$F = 44.50$; $P = 0.000008$

TABLE XXX

PROBABILITY MATRIX FOR SCHEFFE MULTIPLE COMPARISON
OF MEANS FOR DATA IN TABLE XXIX

	1959	1961	1963	1965	1967
1959	1.0000	0.0875	0.0001	0.0000	0.0000
1961		1.0000	0.3930	0.0000	0.0000
1963			1.0000	0.0001	0.0000
1965				1.0000	0.8509
1967					1.0000

TABLE XXXI

SUMMARY OF THE ANALYSIS OF VARIANCE OF THREE-COUNTY BOYS'
VERBAL RAW SCORES ON FORM B OF THE SCAT TEST

Group	Number	Mean	Variance	S. Dev.
1959	241	30.2697	116.3820	10.7880
1961	251	31.7131	135.6385	11.6464
1963	236	34.3390	132.7963	11.5237
1965	240	37.4875	125.8755	11.2194
1967	227	38.6299	126.3946	11.2425
Totals	1195	34.4142	137.2141	11.7138

Homogeneity of Variance CHISQ = 1.6847; P = 0.7935

F = 24.07; P = 0.000004

TABLE XXXII

PROBABILITY MATRIX FOR SCHEFFE MULTIPLE COMPARISON
OF MEANS FOR DATA IN TABLE XXXI

	1959	1961	1963	1965	1967
1959	1.0000	0.7339	0.0039	0.0000	0.0000
1961		1.0000	0.1606	0.0000	0.0000
1963			1.0000	0.0556	0.0023
1965				1.0000	0.8788
1967					1.0000

TABLE XXXIII

SUMMARY OF THE ANALYSIS OF VARIANCE OF THREE-COUNTY BOYS'
VERBAL RAW SCORES ON FORM A OF THE SCAT TEST

Group	Number	Mean	Variance	S. Dev.
1960	221	27.7737	104.6588	10.2303
1962	222	30.2883	94.5419	9.7233
1964	217	34.2442	110.7048	10.5216
1966	229	34.2926	108.3580	10.4095
1968	198	36.4343	112.5320	10.6081
Totals	1087	32.5299	115.1675	10.7316

Homogeneity of Variance Test CHISQ = 2.0314; P = 0.7300

$F = 24.72$; $P = 0.0000$

TABLE XXXIV

PROBABILITY MATRIX FOR SCHEFFE MULTIPLE COMPARISON
OF MEANS FOR DATA IN TABLE XXXIII

	1960	1962	1964	1966	1968
1960	1.0000	0.1590	0.0000	0.0000	0.0000
1962		1.0000	0.0029	0.0020	0.0000
1964			1.0000	1.0000	0.3218
1966				1.0000	0.3320
1968					1.0000

TABLE XXXV

SUMMARY OF THE ANALYSIS OF VARIANCE OF THREE-COUNTY GIRLS'
VERBAL RAW SCORES ON FORM B OF THE SCAT TEST

Group	Number	Mean	Variance	S. Dev.
1959	252	30.6865	144.7112	12.0296
1961	249	33.3695	123.0330	11.0920
1963	246	33.6870	126.5189	11.2481
1965	235	38.0851	140.5836	11.8568
1967	231	38.6710	118.8837	10.9034
Totals	1213	34.7997	139.4446	11.8087

Homogeneity of Variance Test CHISQ = 3.5488; P = 0.4705

F = 21.16; P = 0.000008

TABLE XXXVI

PROBABILITY MATRIX FOR SCHEFFE MULTIPLE COMPARISON
OF MEANS FOR DATA IN TABLE XXXV

	1959	1961	1963	1965	1967
1959	1.0000	0.1425	0.0736	0.0000	0.0000
1961		1.0000	0.9989	0.0004	0.0001
1963			1.0000	0.0014	0.0002
1965				1.0000	0.9894
1967					1.0000

TABLE XXXVII

SUMMARY OF THE ANALYSIS OF VARIANCE OF THREE-COUNTY GIRLS'
VERBAL RAW SCORES ON FORM A OF THE SCAT TEST

Group	Number	Mean	Variance	S. Dev.
1960	237	29.9156	125.5530	11.2050
1962	249	32.6908	94.0058	9.6957
1964	254	35.2008	112.7236	10.6171
1966	220	35.1000	110.0185	10.4890
1968	236	37.9830	121.1750	11.0080
Totals	1196	34.1614	119.3633	10.9254

Homogeneity of Variance Test CHISQ = 5.9548; P = 0.2025

F = 19.38; P = 0.000001

TABLE XXXVIII

PROBABILITY MATRIX FOR SCHEFFE MULTIPLE COMPARISON
OF MEANS FOR DATA IN TABLE XXXVII

	1960	1962	1964	1966	1968
1960	1.0000	0.0815	0.0000	0.0000	0.0000
1962		1.0000	0.1345	0.1980	0.0000
1964			1.0000	1.0000	0.0781
1966				1.0000	0.0783
1968					1.0000

TABLE XXXIX

SUMMARY OF THE ANALYSIS OF VARIANCE OF COUNTY 1 VERBAL
RAW SCORES ON FORM B OF THE SCAT TEST

Group	Number	Mean	Variance	S. Dev.
1959	175	30.4686	113.4583	10.6517
1961	208	32.9760	106.4499	10.3175
1963	198	34.3131	139.4153	11.8074
1965	188	38.3138	122.0571	11.0479
1967	151	40.0397	118.2529	10.8744
Totals	920	35.0369	130.6975	11.4323

Homogeneity of Variance Test CHISQ = 4.0574; P = 0.3983

F = 21.74; P = 0.000007

TABLE XL

PROBABILITY MATRIX FOR SCHEFFE MULTIPLE COMPARISON
OF MEANS FOR DATA IN TABLE XXXIX

	1959	1961	1963	1965	1967
1959	1.0000	0.2902	0.0000	0.0000	0.0000
1961		1.0000	0.8245	0.0001	0.0000
1963			1.0000	0.0123	0.0001
1965				1.0000	0.7212
1967					1.0000

TABLE XLI

SUMMARY OF THE ANALYSIS OF VARIANCE OF COUNTY 1 VERBAL
RAW SCORES ON FORM A OF THE SCAT TEST

Group	Number	Mean	Variance	S. Dev.
1960	169	29.1953	115.1473	10.7307
1962	200	32.4250	88.2870	9.3961
1964	185	36.2973	123.6678	11.1206
1966	168	36.4583	97.0296	9.8504
1968	155	38.5806	104.0126	10.1987
Totals	877	34.4800	115.5408	10.7490

Homogeneity of Variance Test CHISQ = 6.6582; P = 0.1551

F = 22.39; P = 0.000003

TABLE XLII

PROBABILITY MATRIX FOR SCHEFFE MULTIPLE COMPARISON
OF MEANS FOR DATA IN TABLE XLI

	1960	1962	1964	1966	1968
1960	1.0000	0.0603	0.0000	0.0000	0.0000
1962		1.0000	0.0088	0.0073	0.0000
1964			1.0000	0.9999	0.3837
1966				1.0000	0.4865
1968					1.0000

TABLE XLIII

SUMMARY OF THE ANALYSIS OF VARIANCE OF COUNTY 2 VERBAL
RAW SCORES ON FORM B OF THE SCAT TEST

Group	Number	Mean	Variance	S. Dev.
1959	152	28.6382	127.7169	11.3012
1961	128	29.2813	159.1329	12.6148
1963	119	34.0000	125.4068	11.1985
1965	124	37.0645	137.0218	11.7056
1967	122	38.1557	119.3409	10.9243
Totals	645	33.1752	148.2783	12.1770

Homogeneity of Variance Test CHISQ = 3.2142; P = 0. 5226

F = 18.79; P = 0.000003

TABLE XLIV

PROBABILITY MATRIX FOR SCHEFFE MULTIPLE COMPARISON
OF MEANS FOR DATA IN TABLE XLIII

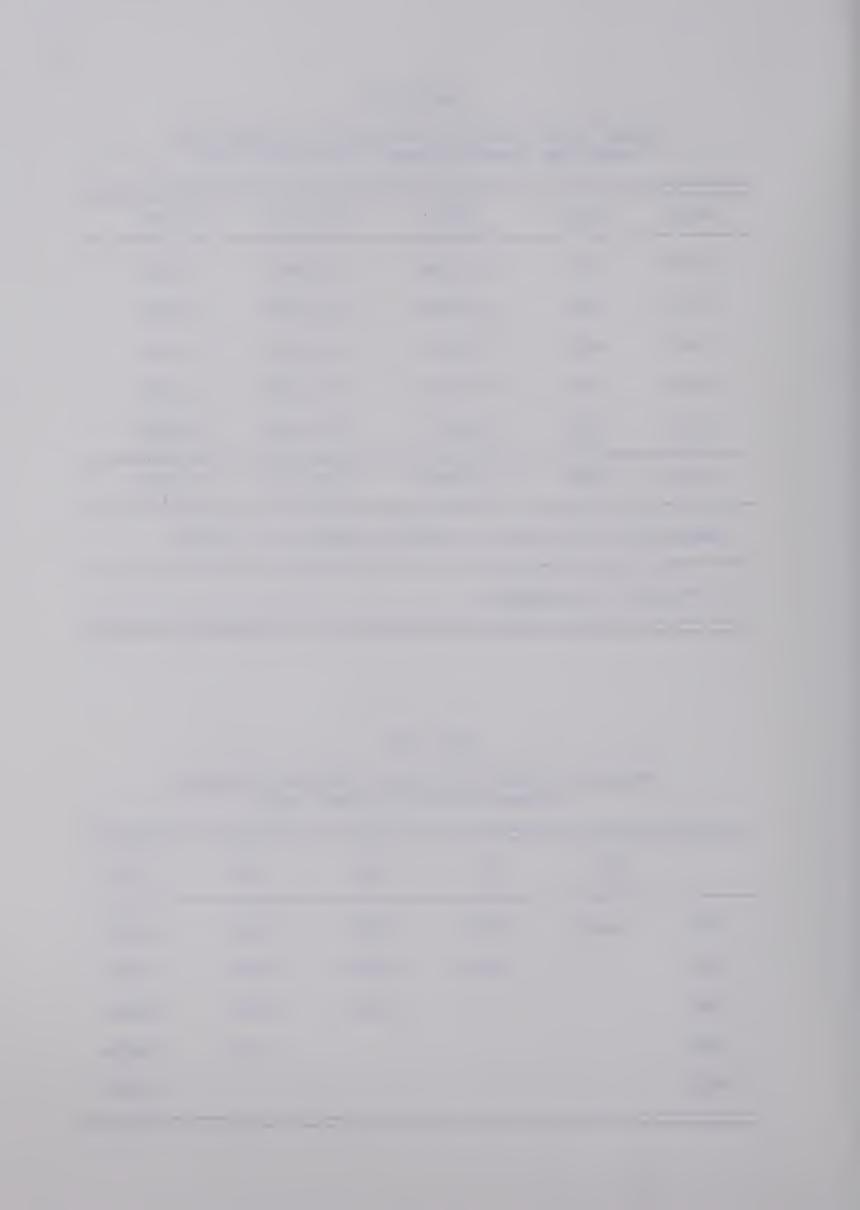|	1959	1961	1963	1965	1967
1959	1.0000	0.9946	0.0066	0.0000	0.0000
1961		1.0000	0.0372	0.0000	0.0000
1963			1.0000	0.3723	0.1014
1965				1.0000	0.9686
1967					1.0000

TABLE XLV

SUMMARY OF THE ANALYSIS OF VARIANCE OF COUNTY 2 VERBAL
RAW SCORES ON FORM A OF THE SCAT TEST

Group	Number	Mean	Variance	S. Dev.
1960	129	28.4496	103.1567	10.1566
1962	102	29.5098	107.0452	10.3463
1964	125	34.0160	100.8080	10.0403
1966	114	35.0789	141.0304	11.8756
1968	135	36.6074	124.4505	11.1557
Totals	605	32.8479	124.6384	11.1642

Homogeneity of Variance Test CHISQ = 4.9448; P = 0.2930

F = 13.62; P = 0.000005

TABLE XLVI

PROBABILITY MATRIX FOR SCHEFFE MULTIPLE COMPARISON
OF MEANS FOR DATA IN TABLE XLV

	1960	1962	1964	1966	1968
1960	1.0000	0.9678	0.0021	0.0001	0.0000
1962		1.0000	0.0433	0.0063	0.0001
1964			1.0000	0.9647	0.4369
1966				1.0000	0.8691
1968					1.0000

TABLE XLVII

SUMMARY OF THE ANALYSIS OF VARIANCE OF COUNTY 3 VERBAL
RAW SCORES ON FORM B OF THE SCAT TEST

Group	Number	Mean	Variance	S. Dev.
1959	166	32.1867	146.9663	12.1230
1961	164	34.5244	125.6143	11.2078
1963	165	33.6424	121.6593	11.0299
1965	163	37.7178	143.3777	11.9740
1967	185	37.8432	126.5689	11.2503
Totals	843	35.2372	137.0090	11.7051

Homogeneity of Variance Test CHISQ = 2.4244; P = 0.6582

F = 8.11; P = 0.000018

TABLE XLVIII

PROBABILITY MATRIX FOR SCHEFFE MULTIPLE COMPARISON
OF MEANS FOR DATA IN TABLE XLVII

	1959	1961	1963	1965	1967
1959	1.0000	0.4940	0.8576	0.0009	0.0003
1961		1.0000	0.9751	0.1800	0.1259
1963			1.0000	0.0369	0.0212
1965				1.0000	1.0000
1967					1.0000

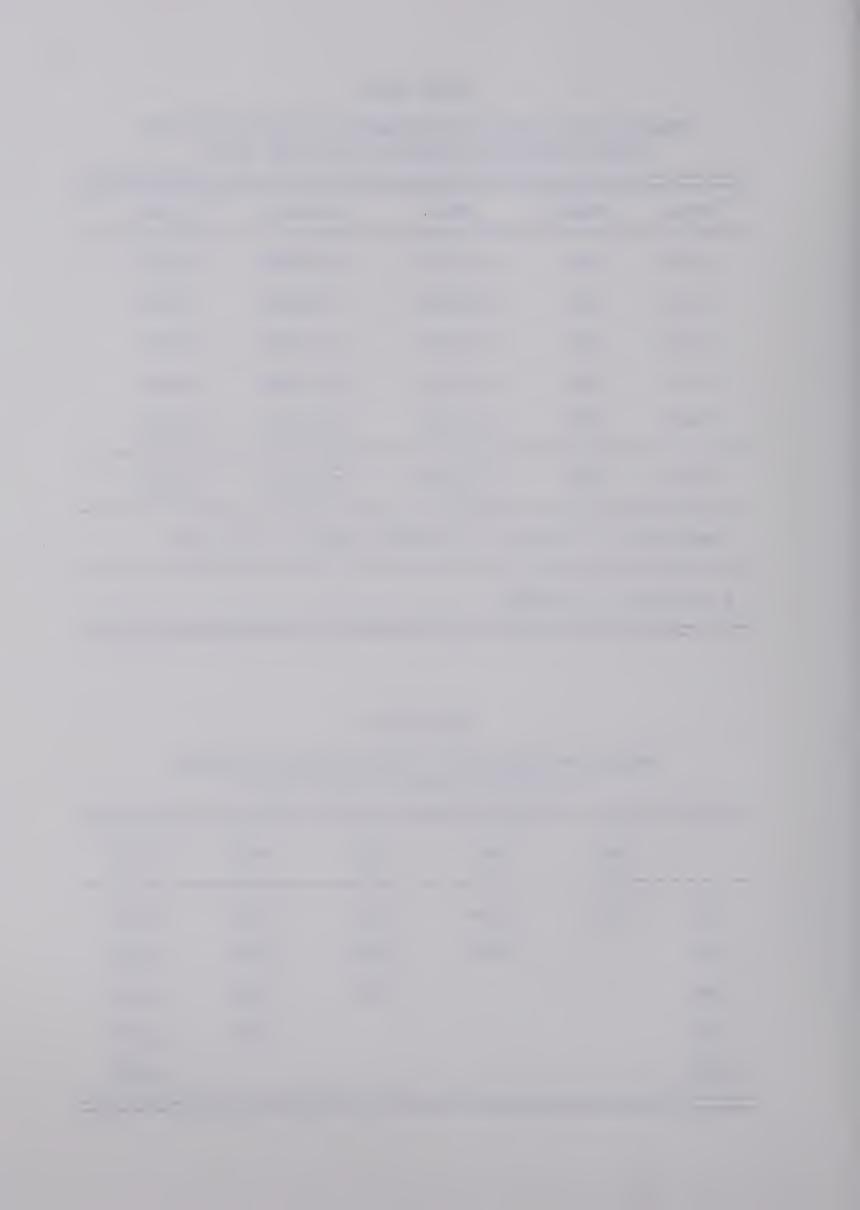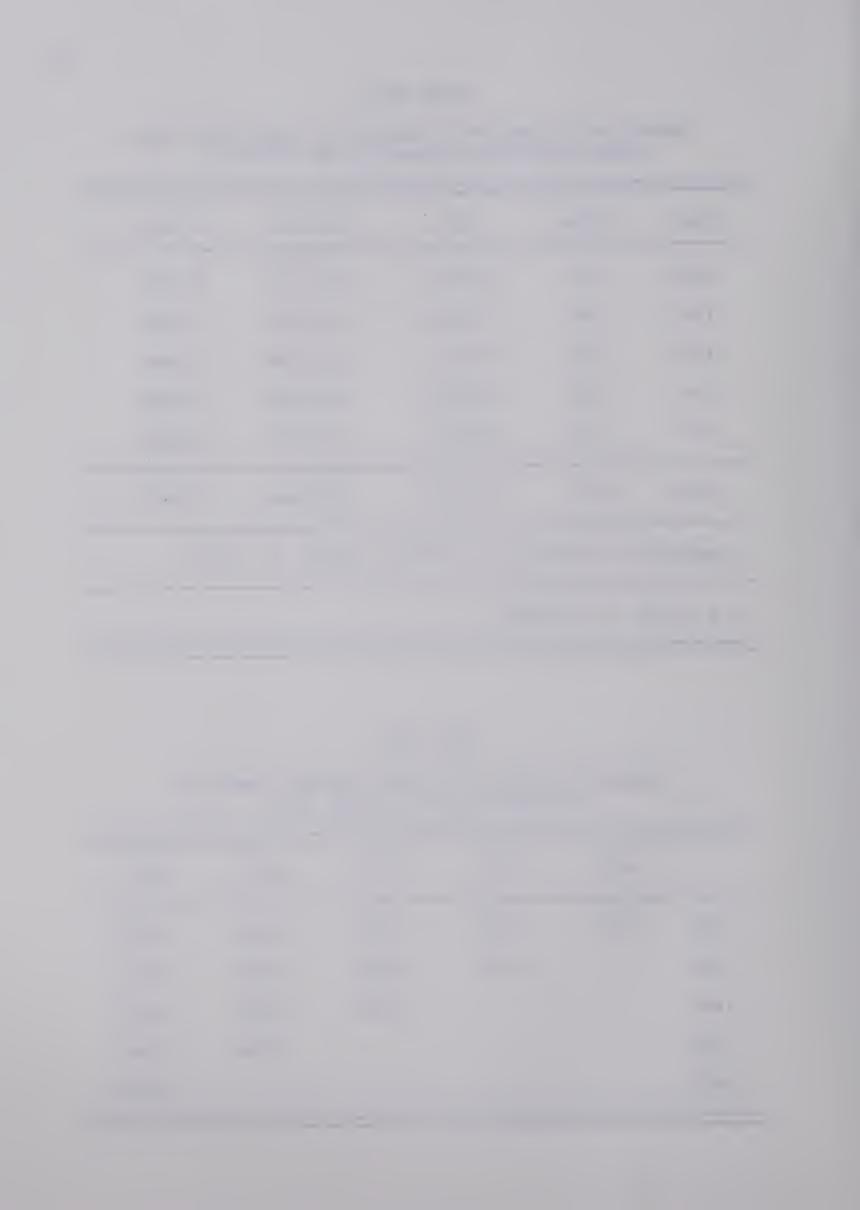TABLE XLIX

SUMMARY OF THE ANALYSIS OF VARIANCE OF COUNTY 3 VERBAL
RAW SCORES ON FORM A OF THE SCAT TEST

Group	Number	Mean	Variance	S. Dev.
1960	160	28.9000	129.5004	11.3798
1962	169	31.7692	94.7511	9.7340
1964	161	33.5714	103.4352	10.1703
1966	167	32.6407	93.3050	9.6594
1968	144	36.5000	124.4615	11.1562
Totals	801	32.5905	113.6008	10.6584

Homogeneity of Variance Test CHISQ = 7.4860; P = 0.1123

F = 10.72; P = 0.000002

TABLE L

PROBABILITY MATRIX FOR SCHEFFE MULTIPLE COMPARISON
OF MEANS FOR DATA IN TABLE XLIX

	1960	1962	1964	1966	1968
1960	1.0000	0.1813	0.0030	0.0330	0.0000
1962		1.0000	0.6503	0.9643	0.0031
1964			1.0000	0.9567	0.1995
1966				1.0000	0.0320
1968					1.0000

A P P E N D I X   B

(Tables LI - LXXIX)

ANALYSIS OF VARIANCE OF QUANTITATIVE RAW SCORES
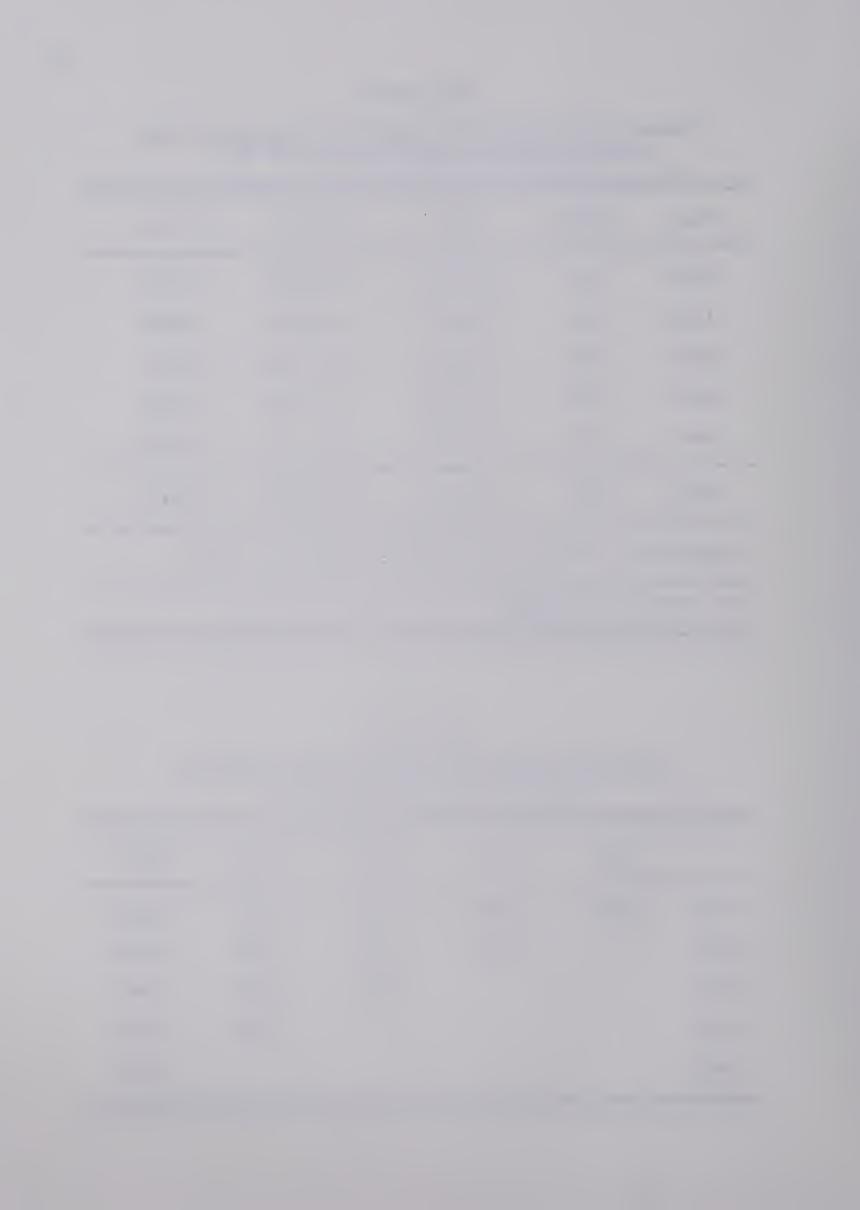
OF THE SCAT TEST

TABLE LI

SUMMARY OF THE ANALYSIS OF VARIANCE OF THREE-COUNTY
QUANTITATIVE RAW SCORES ON FORM A OF THE
SCAT TEST

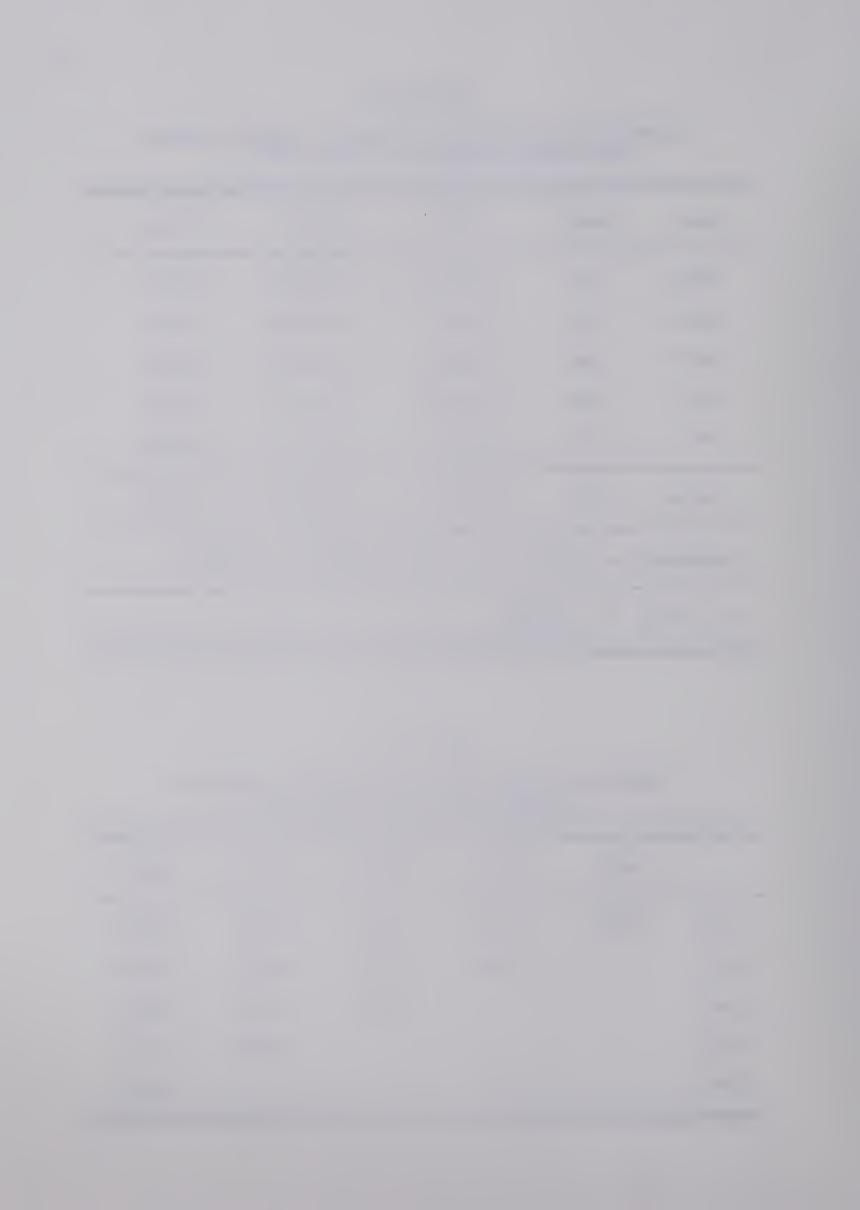| Group	Number	Mean	Variance	S. Dev.
1960	458	31.6310	78.8115	8.8776
1962	471	33.0573	74.4211	8.6268
1964	471	35.1210	68.1368	8.2545
1966	449	33.9376	75.8670	8.7102
1968	434	29.4816	81.3645	8.9585
Totals	2283	32.6903	75.6502	8.6978

Homogeneity of Variance Test CHISQ = 9.4752; P = 0.0531

$F = 27.50$; $P = 0.000007$

TABLE LII

PROBABILITY MATRIX FOR SCHEFFE MULTIPLE COMPARISON
OF MEANS FOR DATA IN TABLE LI

	1960	1962	1964	1966	1968
1960	1.0000	0.1925	0.0000	0.0037	0.0102
1962		1.0000	0.0118	0.6808	0.0000
1964			1.0000	0.3858	0.0000
1966				1.0000	0.0000
1968					1.0000

TABLE LIII

SUMMARY OF THE ANALYSIS OF VARIANCE OF THREE-COUNTY QUANTITATIVE
RAW SCORES ON FORM B OF THE SCAT TEST

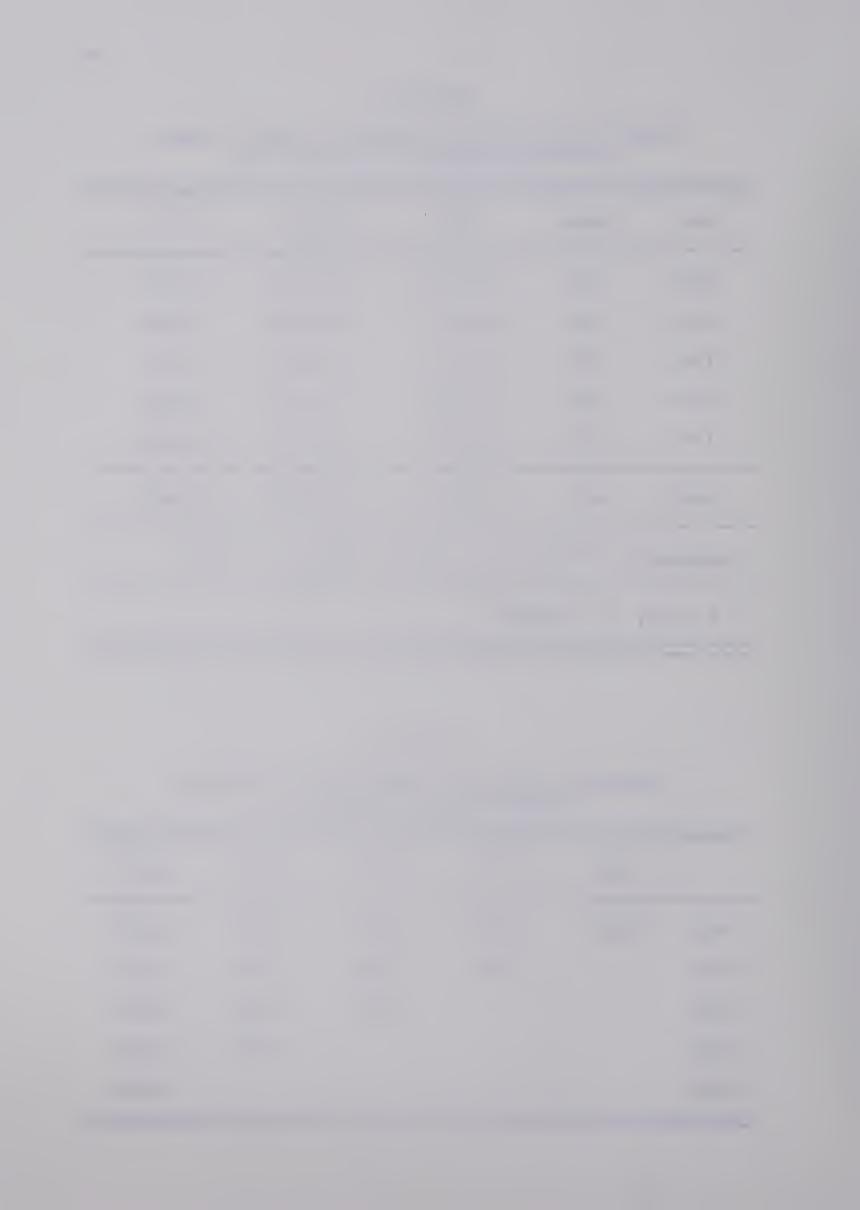| Group	Number	Mean	Variance	S. Dev.
1959	493	32.7180	78.4839	8.8591
1961	500	32.8280	76.4964	8.7462
1963	482	33.8112	67.2474	8.2004
1965	475	35.7284	72.9124	8.5389
1967	458	33.6943	94.1956	9.7054
Totals	2408	33.7392	78.7173	8.8723

Homogeneity of Variance Test CHISQ = 14.8431; P = 0.0050

F = 9.04; P = 0.000056

TABLE LIV

PROBABILITY MATRIX FOR SCHEFFE MULTIPLE COMPARISON OF
MEANS FOR DATA IN TABLE LIII

	1959	1961	1963	1965	1967
1959	1.0000	0.9998	0.4413	0.0001	0.5724
1961		1.0000	0.5488	0.0001	0.6789
1963			1.0000	0.0234	0.9998
1965				1.0000	0.0141
1967					1.0000

NOTE: The researcher is aware that the Scheffé method is
not appropriate where the CHISQ p < 0.05; however, for the sake of
uniformity probability tables have been included with each analysis
of variance.

TABLE LV

SUMMARY OF THE ANALYSIS OF VARIANCE OF THREE-COUNTY QUANTITATIVE
RAW SCORES (BOYS) ON FORM A OF THE SCAT TEST

Group	Number	Mean	Variance	S. Dev.
1960	221	31.6768	74.6042	8.6374
1962	222	32.5270	80.3235	8.9623
1964	217	35.0415	73.7630	8.5885
1966	229	33.9607	77.8459	8.8230
1968	198	29.2677	84.0863	9.1699
Totals	1087	32.5685	81.4236	9.0235

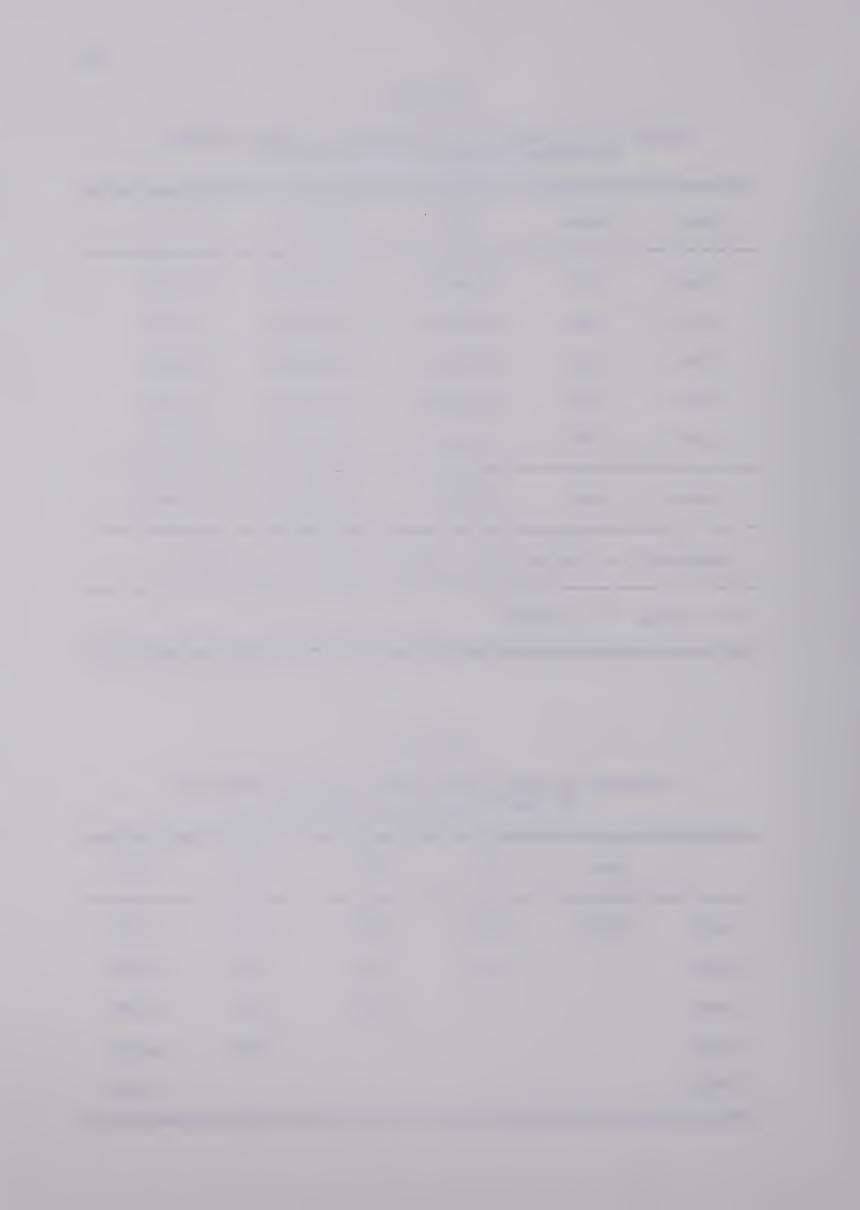Homogeneity of Variance Test CHISQ = 1.2087; P = 0.8767

F = 13.13; P = 0.000009

TABLE LVI

PROBABILITY MATRIX FOR SCHEFFE MULTIPLE COMPARISON
OF MEANS FOR DATA IN TABLE LV

	1960	1962	1964	1966	1968
1960	1.0000	0.9129	0.0036	0.1175	0.0961
1962		1.0000	0.0645	0.5630	0.0068
1964			1.0000	0.7964	0.0000
1966				1.0000	0.0000
1968					1.0000

TABLE LVII

SUMMARY OF THE ANALYSIS OF VARIANCE OF THREE-COUNTY QUANTITATIVE
RAW SCORES (BOYS) ON FORM B OF THE SCAT TEST

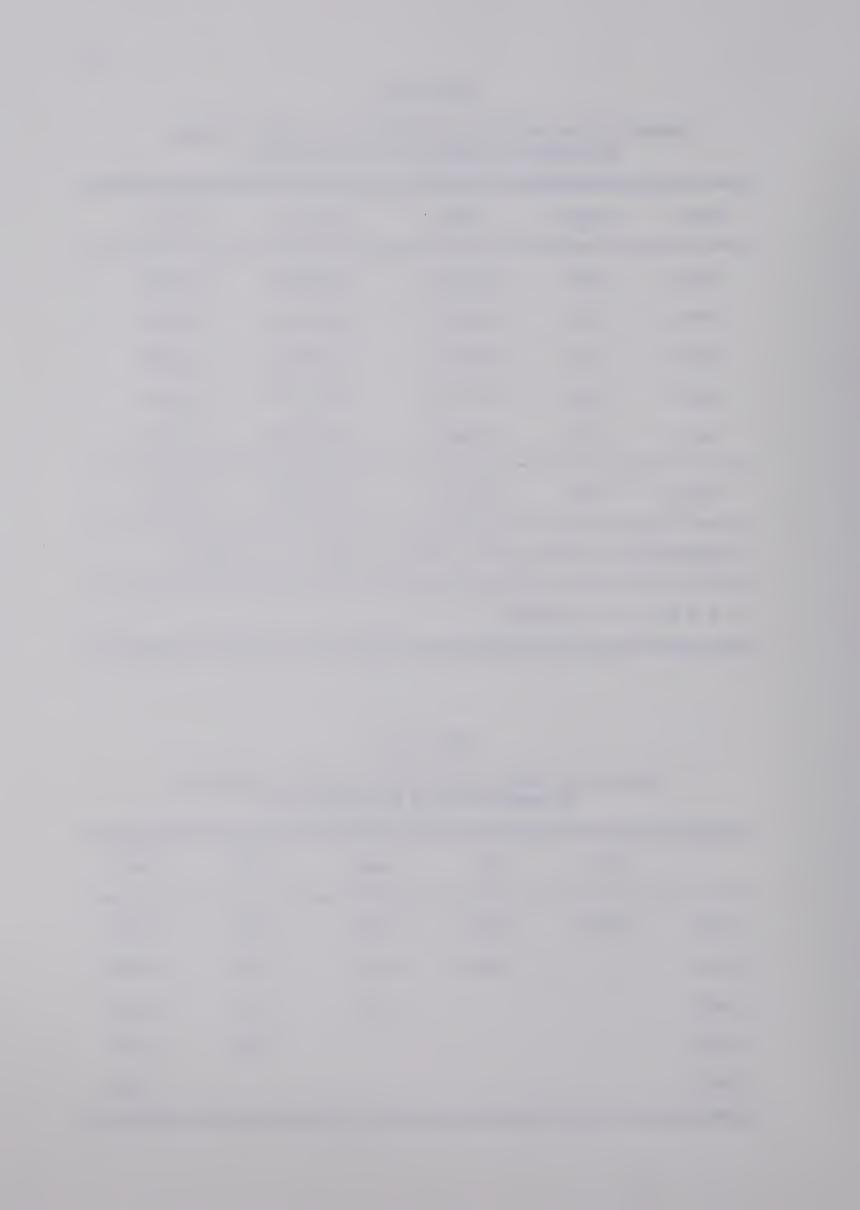| Group	Number	Mean	Variance	S. Dev.
1959	241	32.8714	78.8799	8.8814
1961	251	32.3745	78.5640	8.8636
1963	236	33.7500	71.4138	8.4507
1965	240	36.1333	63.5228	7.9701
1967	227	34.2070	97.3515	9.8667
Totals	1195	33.8494	79.1611	8.8973

Homogeneity of Variance Test CHISQ = 11.5782; P = 0.0208

F = 6.62; P = 0.000064

TABLE LVIII

PROBABILITY MATRIX FOR SCHEFFE MULTIPLE COMPARISON
OF MEANS FOR DATA IN TABLE LVIII

	1959	1961	1963	1965	1967
1959	1.0000	0.9832	0.8806	0.0026	0.6124
1961		1.0000	0.5648	0.0002	0.2730
1963			1.0000	0.0699	0.9891
1965				1.0000	0.2346
1967					1.0000

TABLE LIX

SUMMARY OF THE ANALYSIS OF VARIANCE OF THREE-COUNTY GIRLS'
QUANTITATIVE RAW SCORES ON FORM A OF THE SCAT TEST

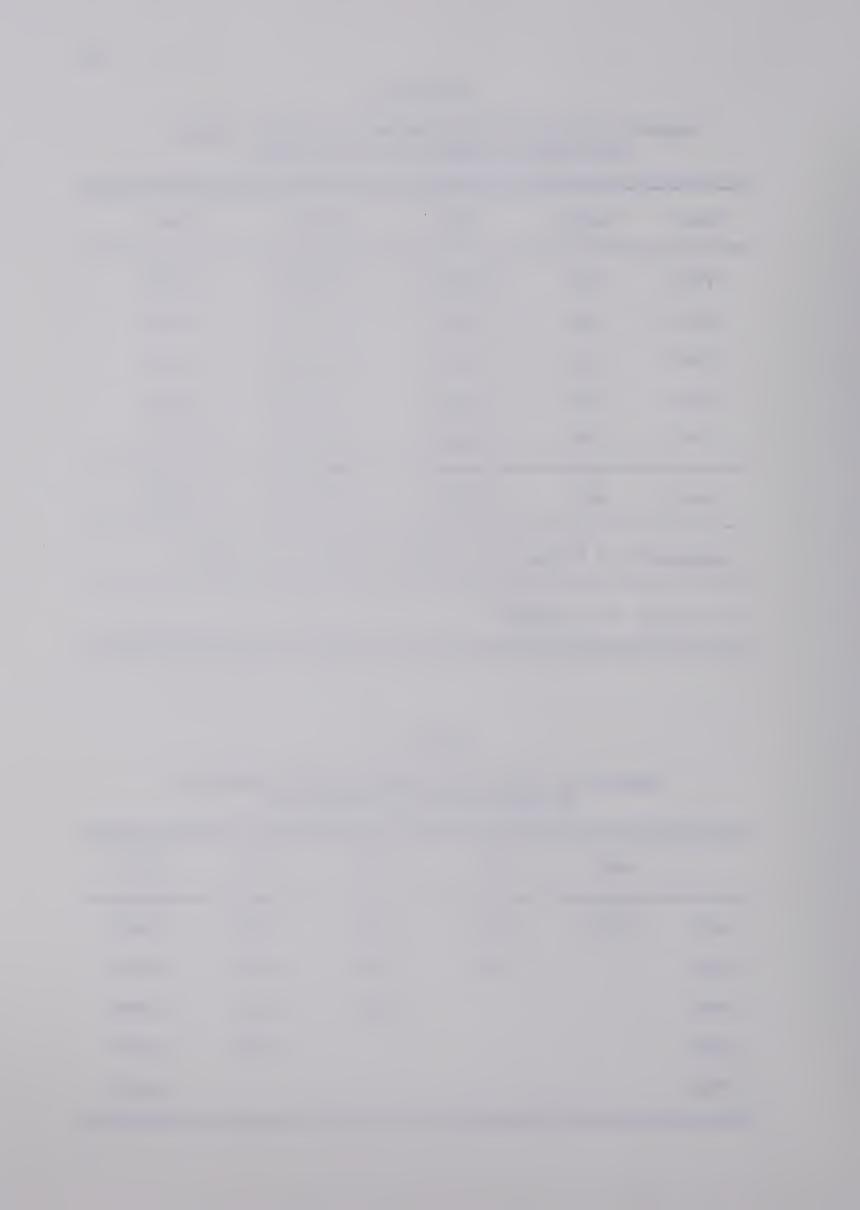| Group	Number	Mean	Variance	S. Dev.
1960	237	31.5696	83.0606	9.1138
1962	249	33.5301	68.9851	8.3057
1964	254	35.1890	63.5936	7.9746
1966	220	33.9136	74.1530	8.6112
1968	236	29.6610	97.7832	9.8885
Totals	1196	32.8010	80.7336	8.9852

Homogeneity of Variance Test CHISQ = 13.8829; P = 0.0077

F = 14.69; P = 0.000012

TABLE LX

PROBABILITY MATRIX FOR SCHEFFE MULTIPLE COMPARISON
OF MEANS FOR DATA IN TABLE LIX

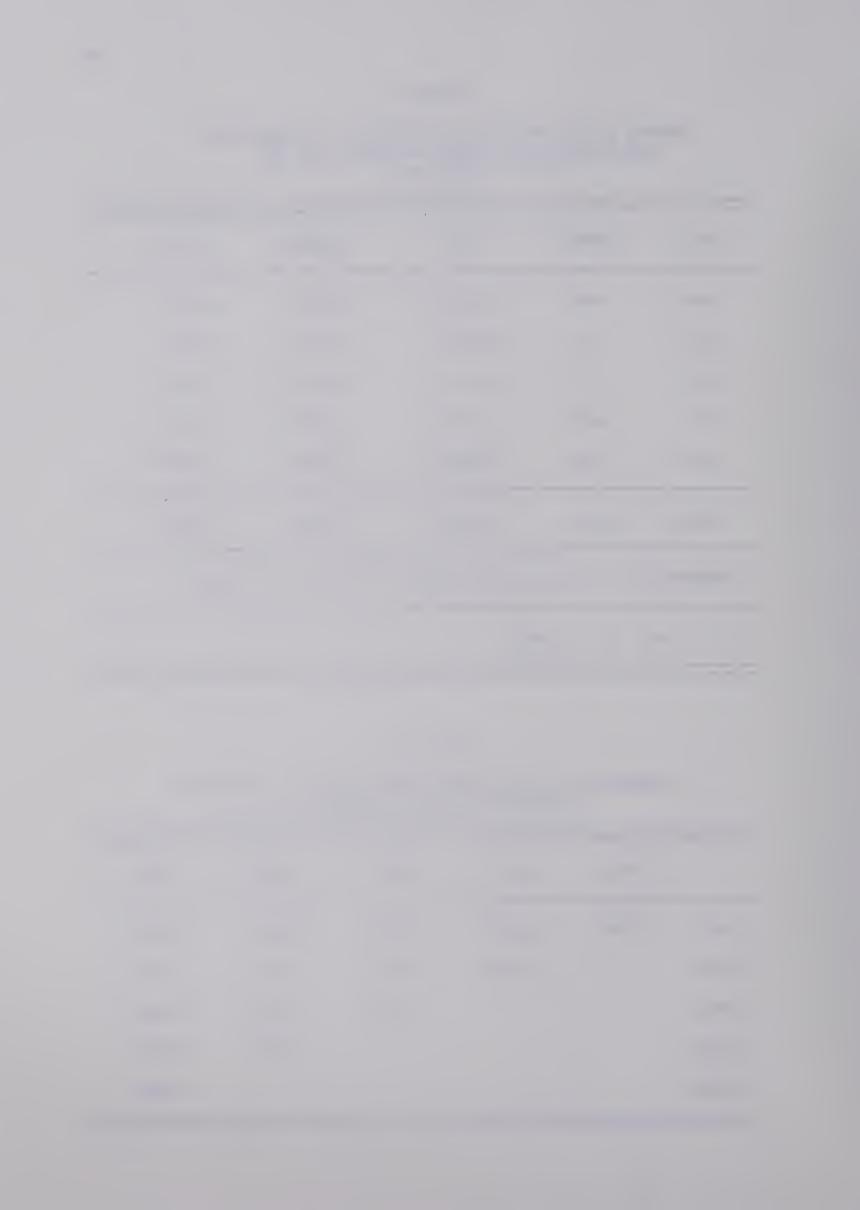|	1960	1962	1964	1966	1968
1960	1.0000	0.1968	0.0004	0.0882	0.2338
1962		1.0000	0.3456	0.9942	0.0001
1964			1.0000	0.6479	0.0000
1966				1.0000	0.0001
1968					1.0000

TABLE LXI

SUMMARY OF THE ANALYSIS OF VARIANCE OF THREE-COUNTY GIRLS'
QUANTITATIVE RAW SCORES ON FORM B OF THE SCAT TEST

Group	Number	Mean	Variance	S. Dev.
1959	252	32.5714	78.3740	8.8529
1961	249	33.2851	74.3027	8.6199
1963	246	33.8699	63.5189	7.9699
1965	235	35.3149	82.4743	9.0815
1967	231	33.1905	90.9905	9.5389
Totals	1213	33.6307	78.2563	8.8463

Homogeneity of Variance Test CHISQ = 8.3455; P = 0.0797

F = 3.34; P = 0.009974

TABLE LXII

PROBABILITY MATRIX FOR SCHEFFE MULTIPLE COMPARISON
OF MEANS FOR DATA IN TABLE LXI

	1959	1961	1963	1965	1967
1959	1.0000	0.9355	0.6092	0.0195	0.9636
1961		1.0000	0.9690	0.1713	1.0000
1963			1.0000	0.5205	0.9502
1965				1.0000	0.1495
1967					1.0000

TABLE LXIII

SUMMARY OF THE ANALYSIS OF VARIANCE OF COUNTY 1 QUANTITATIVE
RAW SCORES ON FORM B OF THE SCAT TEST

Group	Number	Mean	Variance	S. Dev.
1959	175	32.0286	69.9601	8.3642
1961	208	32.6683	66.4943	8.1544
1963	198	32.9798	71.5739	8.4601
1965	188	36.9574	57.0475	7.5530
1967	151	35.1324	112.8637	10.6237
Totals	920	33.8946	76.8662	8.7673

Homogeneity of Variance Test CHISQ = 22.7433; P = 8.7673

F = 10.42; P = 0.000009

TABLE LXIV

PROBABILITY MATRIX FOR SCHEFFE MULTIPLE COMPARISON
OF MEANS FOR DATA IN TABLE LXIII

	1959	1961	1963	1965	1967
1959	1.0000	0.9708	0.8882	0.0000	0.0325
1961		1.0000	0.9979	0.0001	0.1273
1963			1.0000	0.0004	0.2522
1965				1.0000	0.4380
1967					1.0000

TABLE LXV

SUMMARY OF THE ANALYSIS OF VARIANCE OF COUNTY 1 QUANTITATIVE
RAW SCORES ON FORM A OF THE SCAT TEST

Group	Number	Mean	Variance	S. Dev.
1960	169	31.4852	77.8002	8.8204
1962	200	32.9650	67.7635	8.2319
1964	185	36.1568	72.9708	8.5423
1966	168	36.2262	58.1295	7.6243
1968	155	30.0516	91.7776	9.5801
Totals	877	33.4629	78.6343	8.8676

Homogeneity of Variance Test CHISQ = 9.2443; P = 0.0553

F = 17.56; P = 0.000004

TABLE LXVI

PROBABILITY MATRIX FOR SCHEFFE MULTIPLE COMPARISON
OF MEANS FOR DATA IN TABLE LXV

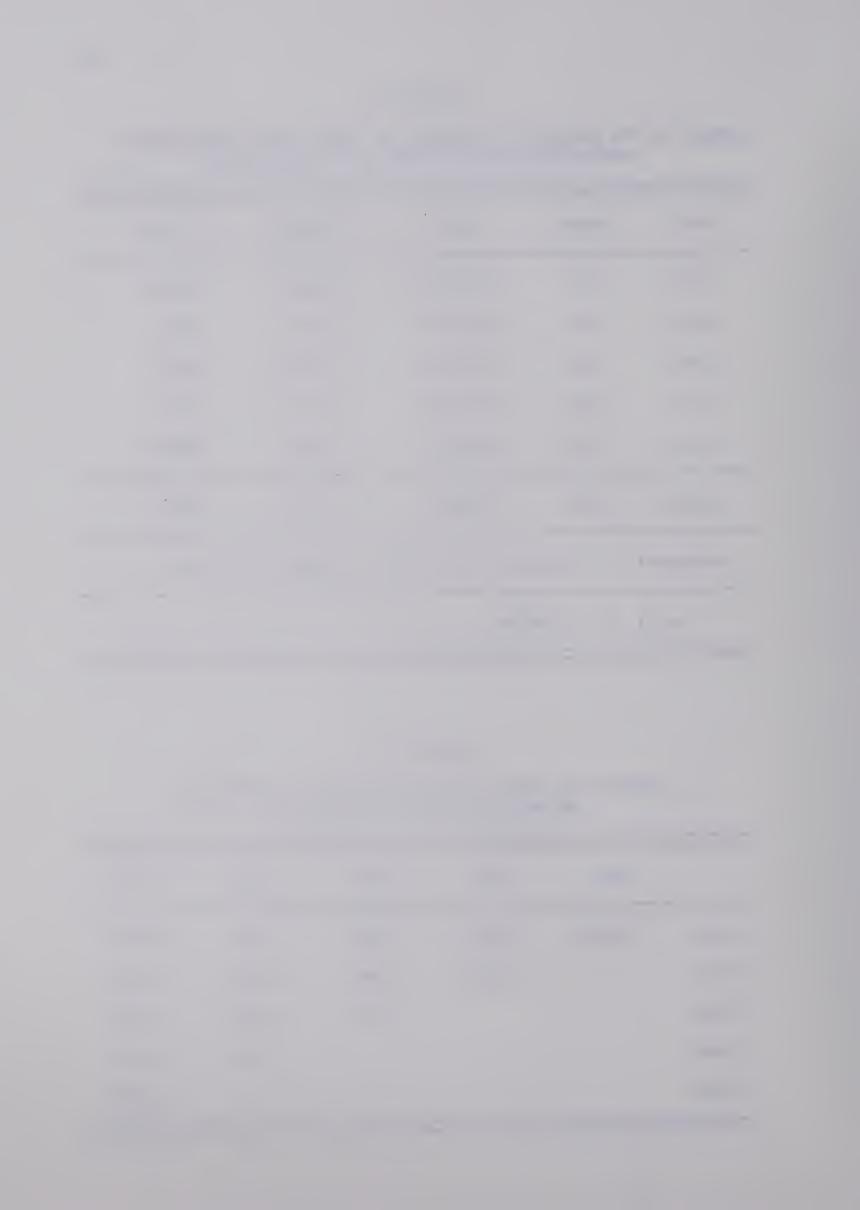|	1960	1962	1964	1966	1968
1960	1.0000	0.6023	0.0000	0.0001	0.6862
1962		1.0000	0.0100	0.0104	0.0391
1964			1.0000	1.0000	0.0000
1966				1.0000	0.0000
1968					1.0000

TABLE LXVII

SUMMARY OF THE ANALYSIS OF VARIANCE OF COUNTY 2 QUANTITATIVE
RAW SCORES ON FORM A OF THE SCAT TEST

Group	Number	Mean	Variance	S. Dev.
1960	129	29.3798	83.0977	9.1158
1962	102	30.1667	85.9431	9.2705
1964	125	33.2880	61.2888	7.8287
1966	114	31.4912	91.9696	9.5901
1968	135	28.5555	88.8172	9.4243
Totals	605	30.5339	84.2593	9.1793

Homogeneity of Variance Test CHISQ = 6.0959; P = 0.1921

F = 5.38; P = 0.000293

TABLE LXVIII

PROBABILITY MATRIX FOR SCHEFFE MULTIPLE COMPARISON
OF MEANS FOR DATA IN TABLE LXVII

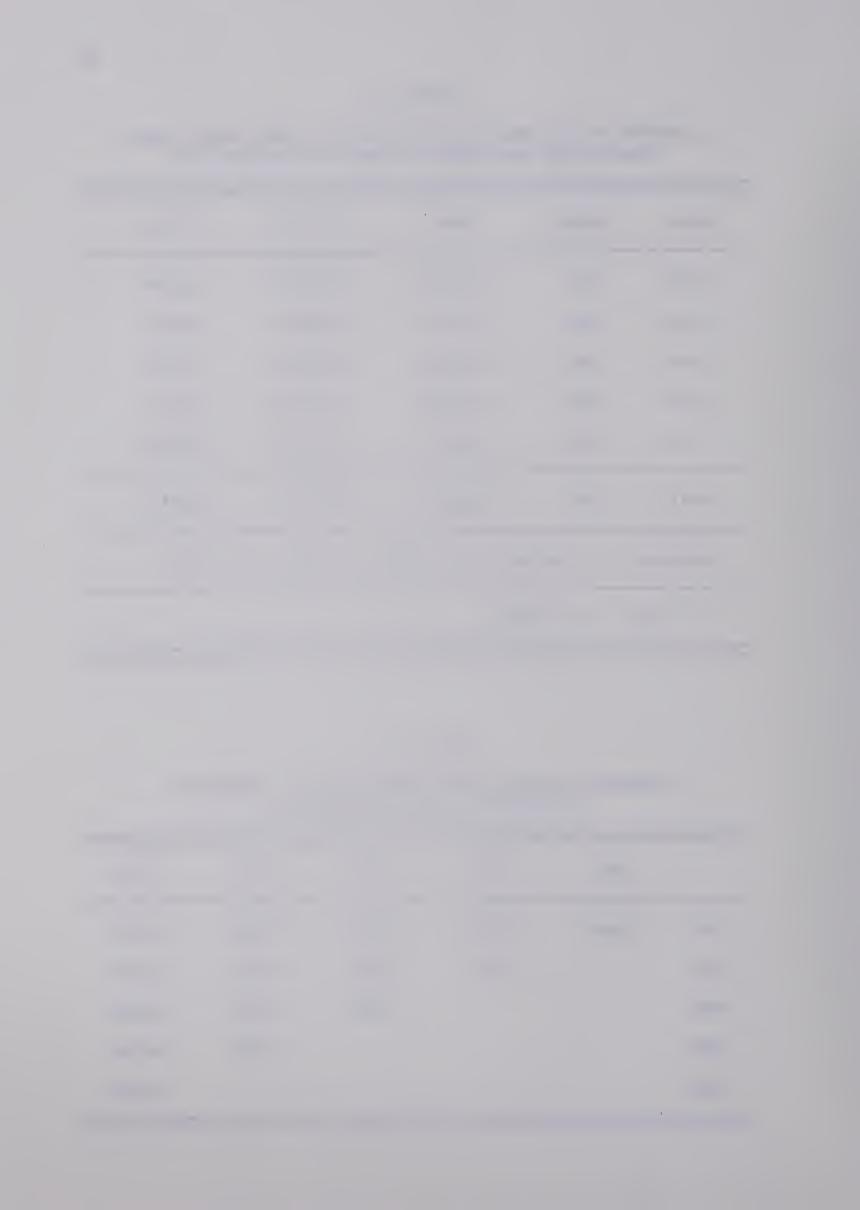|	1960	1962	1964	1966	1968
1960	1.0000	0.9799	0.0195	0.5111	0.9687
1962		1.0000	0.1558	0.8858	0.7653
1964			1.0000	0.6723	0.0016
1966				1.0000	0.1666
1968					1.0000

TABLE LXIX

SUMMARY OF THE ANALYSIS OF VARIANCE OF COUNTY 2 QUANTITATIVE
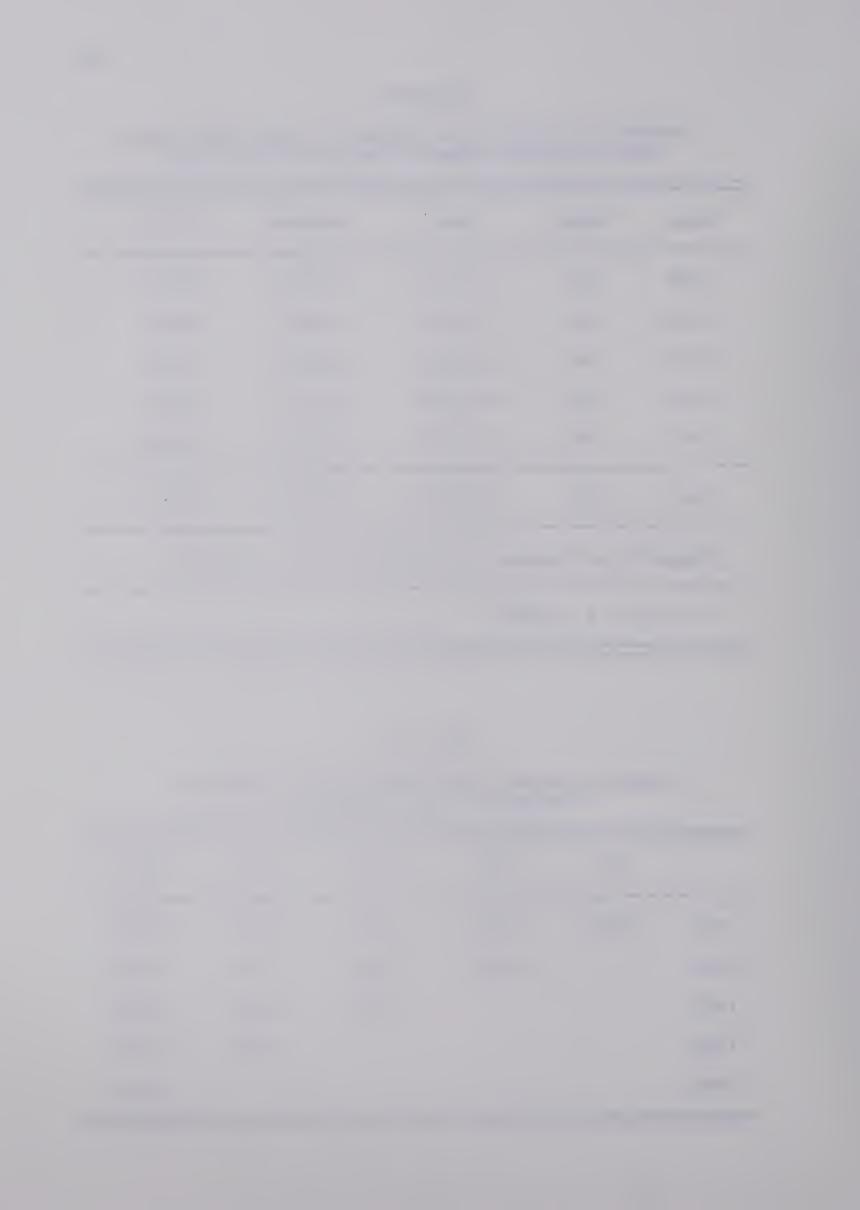RAW SCORES ON FORM B OF THE SCAT TEST

Group	Number	Mean	Variance	S. Dev.
1959	152	31.2632	91.2425	9.5521
1961	128	29.9062	85.2195	9.2314
1963	119	33.3949	65.3607	8.0846
1965	124	33.6693	75.8511	8.7093
1967	122	31.8934	87.9814	9.3798
Totals	645	31.9690	82.9612	9.1083

Homogeneity of Variance Test CHISQ = 4.4596; P = 0.3474

F = 3.74; P = 0.005123

TABLE LXX

PROBABILITY MATRIX FOR SCHEFFE MULTIPLE COMPARISON
OF MEANS FOR DATA IN TABLE LXIX

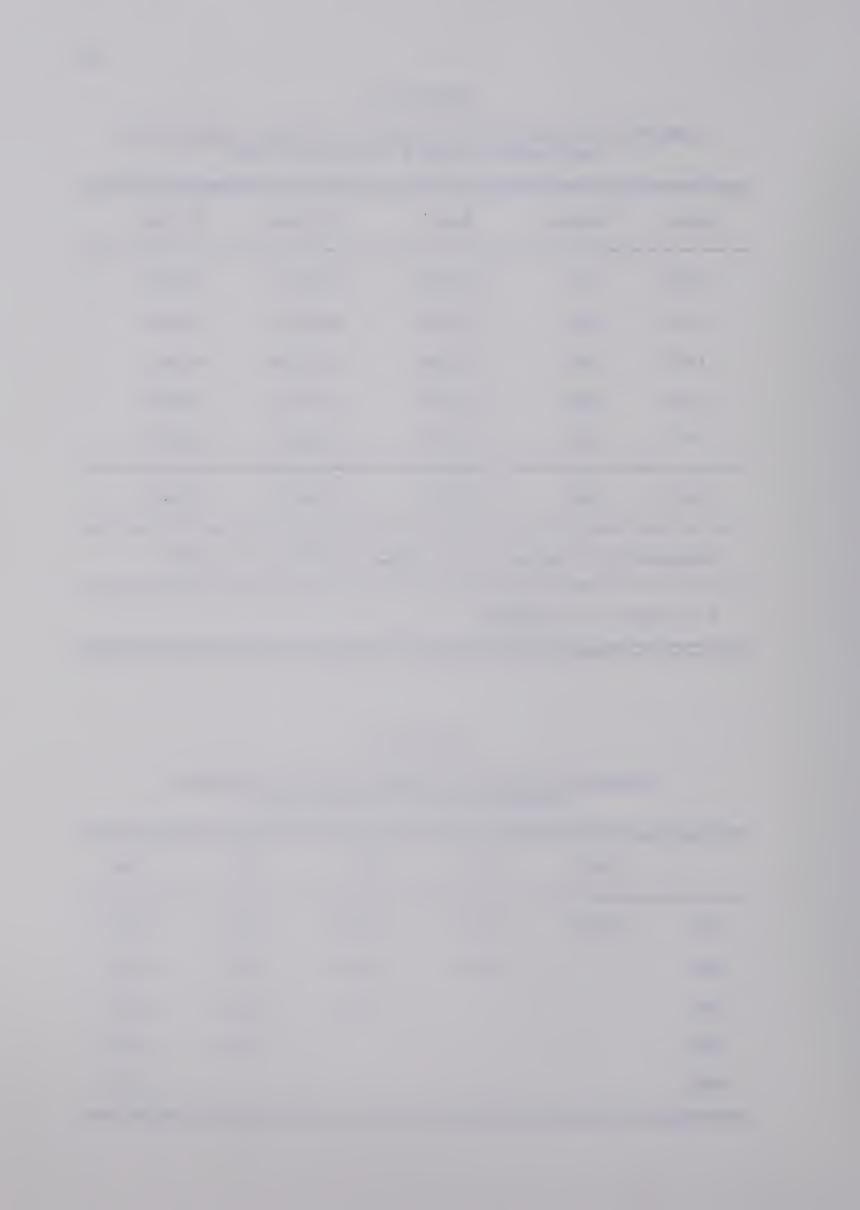|	1959	1961	1963	1965	1967
1959	1.0000	0.8148	0.4469	0.3053	0.9878
1961		1.0000	0.0578	0.0284	0.5550
1963			1.0000	0.9996	0.7974
1965				1.0000	0.6674
1967					1.0000

TABLE LXXI

SUMMARY OF THE ANALYSIS OF VARIANCE OF COUNTY 3 QUANTITATIVE
RAW SCORES ON FORM A OF THE SCAT TEST

Group	Number	Mean	Variance	S. Dev.
1960	160	33.6000	69.3876	8.3299
1962	169	34.9112	67.7254	8.2295
1964	161	35.3540	64.8187	8.0510
1966	167	33.3054	73.8535	8.5938
1968	144	29.7361	93.3579	9.6622
Totals	801	33.4731	76.5649	8.7501

Homogeneity of Variance Test CHISQ = 6.4384; P = 0.1687

F = 10.01; P = 0.000018

TABLE LXXII

PROBABILITY MATRIX FOR SCHEFFE MULTIPLE COMPARISON
OF MEANS FOR DATA IN TABLE LXXI

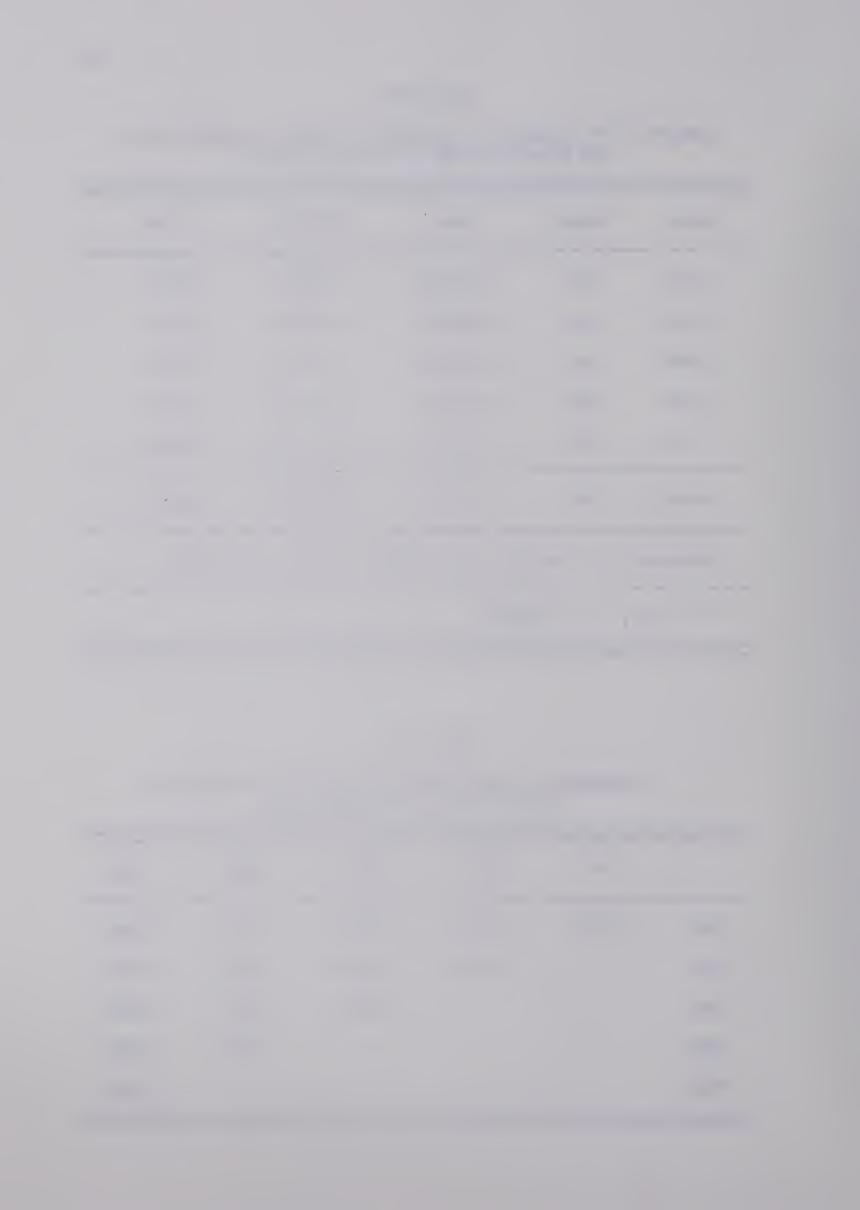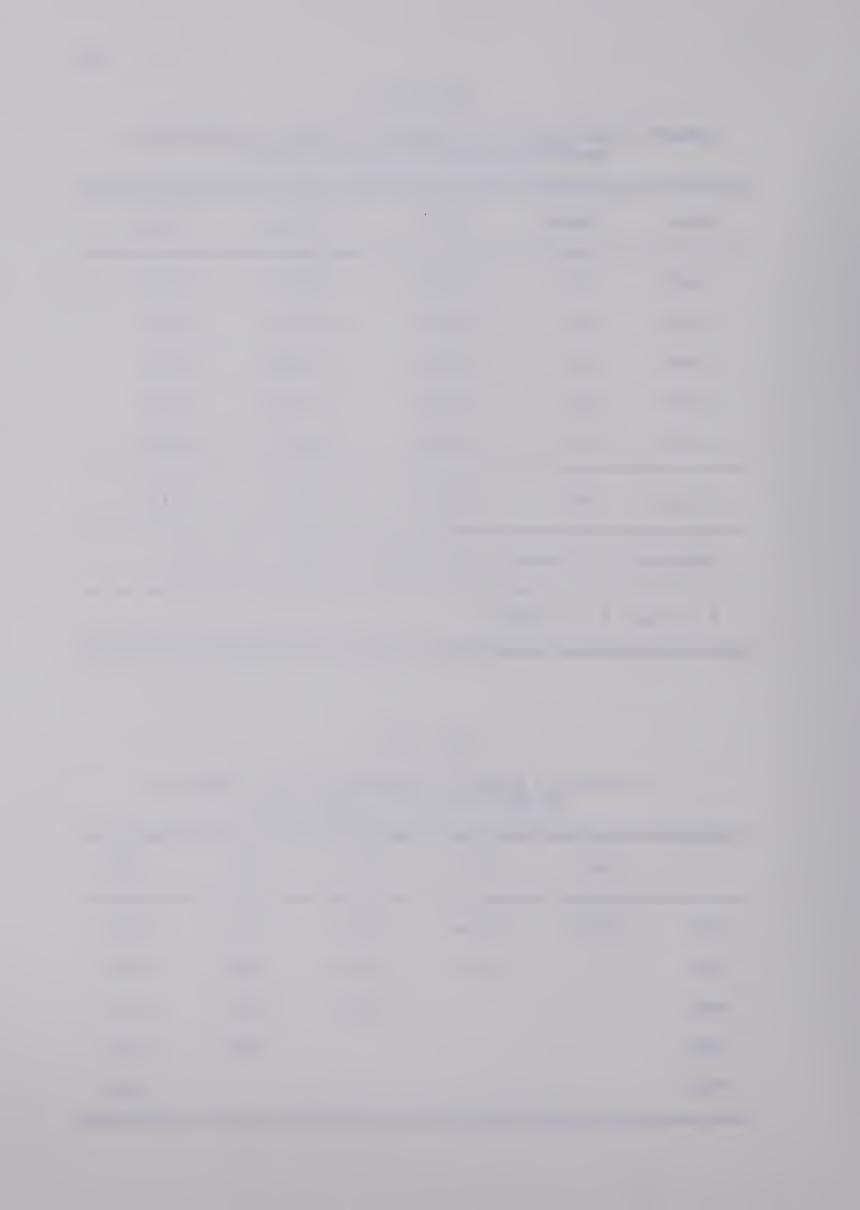|	1960	1962	1964	1966	1968
1960	1.0000	0.7492	0.4990	0.9989	0.0041
1962		1.0000	0.9943	0.5660	0.0000
1964			1.0000	0.3214	0.0000
1966				1.0000	0.0098
1968					1.0000

TABLE LXXIII

SUMMARY OF THE ANALYSIS OF VARIANCE OF COUNTY 3 QUANTITATIVE
RAW SCORES ON FORM B OF THE SCAT TEST

Group	Number	Mean	Variance	S. Dev.
1959	166	34.7771	70.0303	8.3684
1961	164	35.3111	70.4007	8.3905
1963	165	35.1091	61.5747	7.8470
1965	163	35.8773	84.8754	9.2128
1967	185	33.7081	80.2415	8.9578
Total	843	34.9241	73.6626	8.5827

Homogeneity of Variance Test CHISQ = 5.2419; P = 0.2634

$F = 1.55$; $P = 0.186443$

TABLE LXXIX

PROBABILITY MATRIX FOR SCHEFFE MULTIPLE COMPARISON
OF MEANS FOR DATA IN TABLE LXXIII

	1959	1961	1963	1965	1967
1959	1.0000	0.9885	0.9981	0.8521	0.8511
1961		1.0000	0.9997	0.9859	0.5520
1963			1.0000	0.9563	0.6759
1965				1.0000	0.2369
1967					1.0000

A P P E N D I X   C

(Tables LXXX - CII)

ANALYSIS OF VARIANCE OF TOTAL RAW SCORES
OF THE SCAT TEST

TABLE LXXX

SUMMARY OF THE ANALYSIS OF VARIANCE OF THREE-COUNTY TOTAL
RAW SCORES ON FORM A OF THE SCAT TEST

Group	Number	Mean	Variance	S. Dev.
1960	458	60.4716	308.2952	17.5583
1962	471	64.6030	258.6084	16.0813
1964	471	69.8981	281.7275	16.7847
1966	449	68.6258	294.6272	17.1647
1968	434	66.7604	334.0897	18.2806
Totals	2283	66.0679	304.9805	17.3208

Homogeneity of Variance Test CHISQ = 9.4018; P = 0.0501

$F = 21.42$; $P = 0.000026$

TABLE LXXXI

PROBABILITY MATRIX FOR SCHEFFE MULTIPLE COMPARISON
OF MEANS FOR DATA IN TABLE LXXX

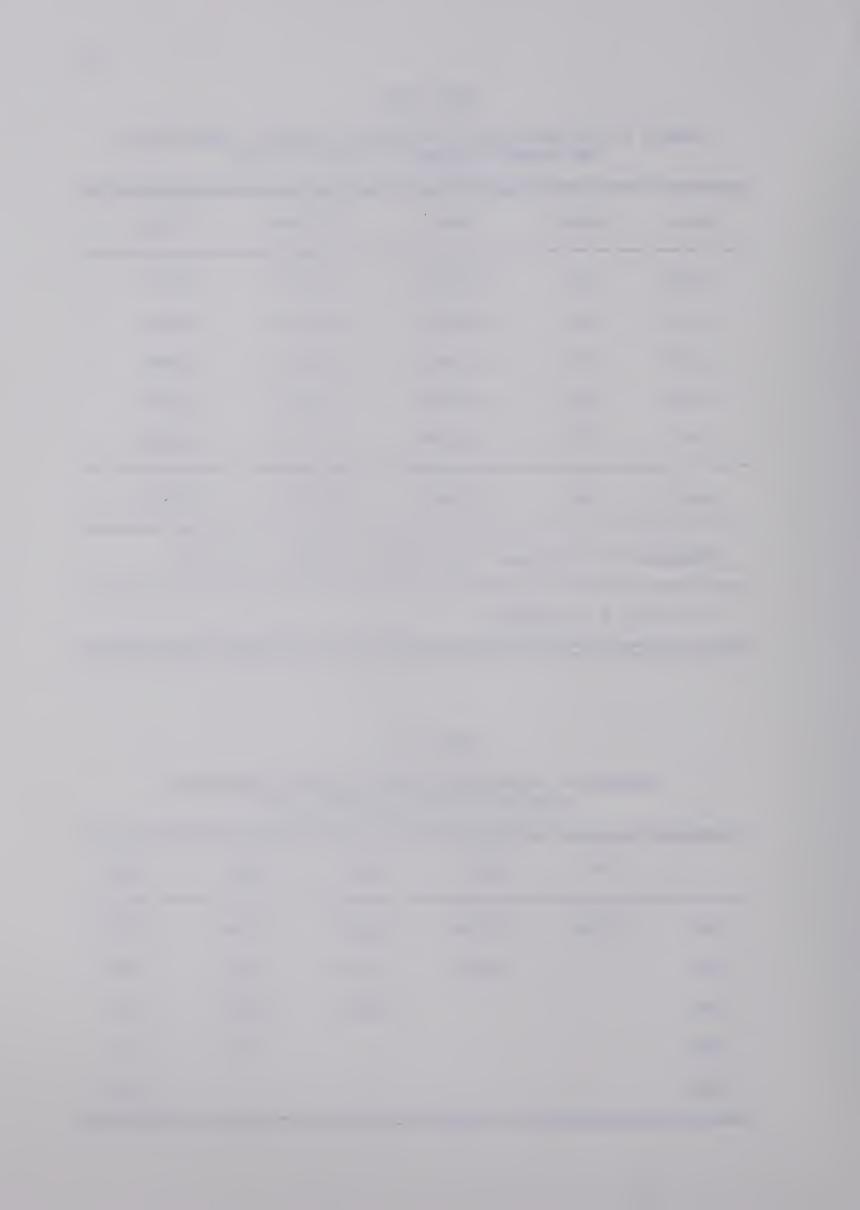|	1960	1962	1964	1966	1968
1960	1.0000	0.0097	0.0000	0.0000	0.0000
1962		1.0000	0.0000	0.0139	0.4710
1964			1.0000	0.8687	0.1120
1966				1.0000	0.6283
1968					1.0000

TABLE LXXXII

SUMMARY OF THE ANALYSIS OF VARIANCE OF THREE-COUNTY TOTAL
RAW SCORES ON FORM B OF THE SCAT TEST

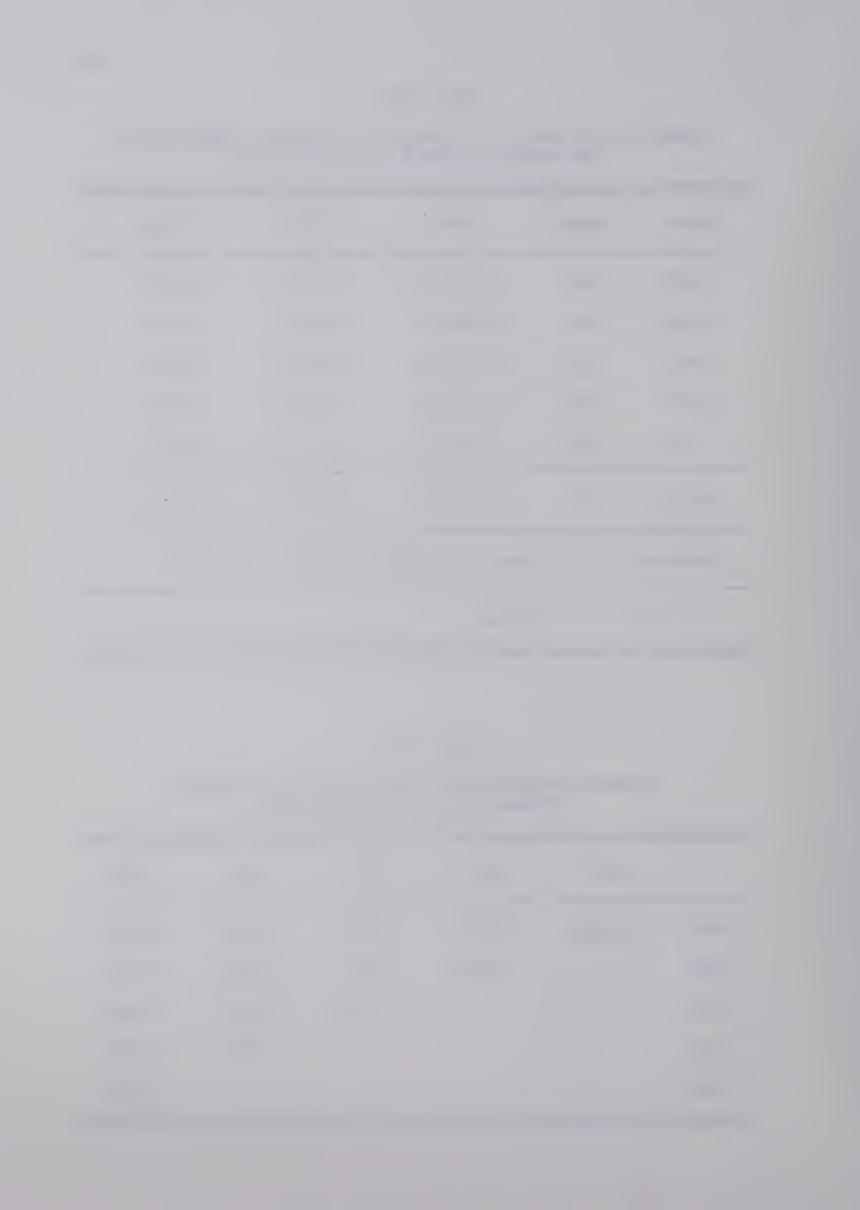| Group	Number	Mean	Variance	S. Dev.
1959	493	63.2028	336.7092	18.3496
1961	500	65.3240	324.0940	18.0026
1963	482	67.8610	311.7856	17.6574
1965	475	73.4168	334.3965	18.2865
1967	458	73.3930	906.2231	30.1035
Totals	2408	68.5286	453.2891	21.2906

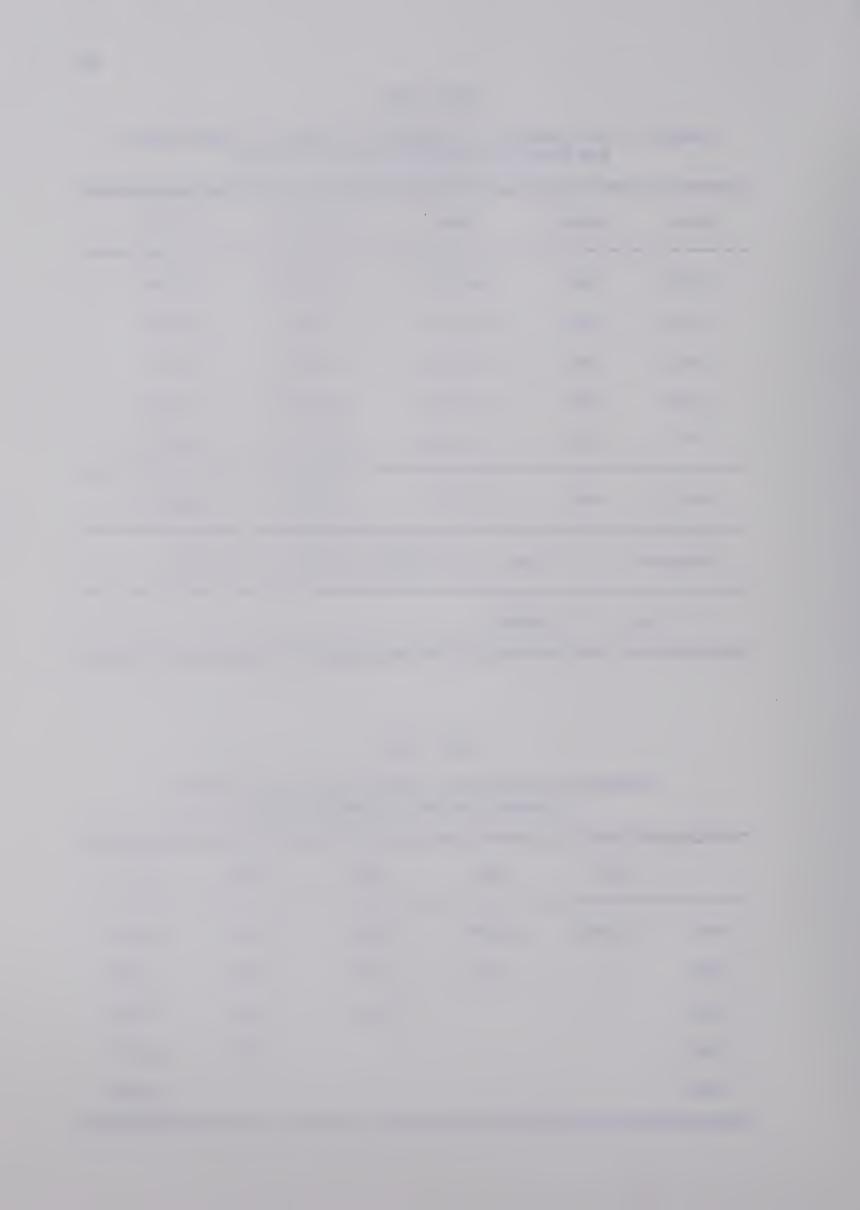Homogeneity of Variance Test CHISQ = 232.9037; P = 0.0000

F = 23.75; P = 0.000007

TABLE LXXXIII

PROBABILITY MATRIX FOR SCHEFFE MULTIPLE COMPARISON
OF MEANS FOR DATA IN TABLE LXXXII

	1959	1961	1963	1965	1967
1959	1.0000	0.6343	0.0168	0.0000	0.0000
1961		1.0000	0.4606	0.0001	0.0000
1963			1.0000	0.0021	0.0026
1965				1.0000	1.0000
1967					1.0000

TABLE LXXXIV

SUMMARY OF THE ANALYSIS OF VARIANCE OF THREE-COUNTY BOYS'
TOTAL RAW SCORES ON FORM A OF THE SCAT TEST

Group	Number	Mean	Variance	S. Dev.
1960	221	59.4253	273.5286	16.5387
1962	222	62.8153	258.4333	16.0759
1964	217	69.3180	283.9143	16.8497
1966	229	68.2533	293.1577	17.1218
1968	198	65.6515	319.2251	17.8669
Totals	1087	65.0865	296.9766	17.2330

Homogeneity of Variance Test CHISQ = 2.6123; P = 0.6246

F = 12.70; P = 0.000011

TABLE LXXXV

PROBABILITY MATRIX FOR SCHEFFE MULTIPLE COMPARISON
OF MEANS FOR DATA IN TABLE LXXXIV

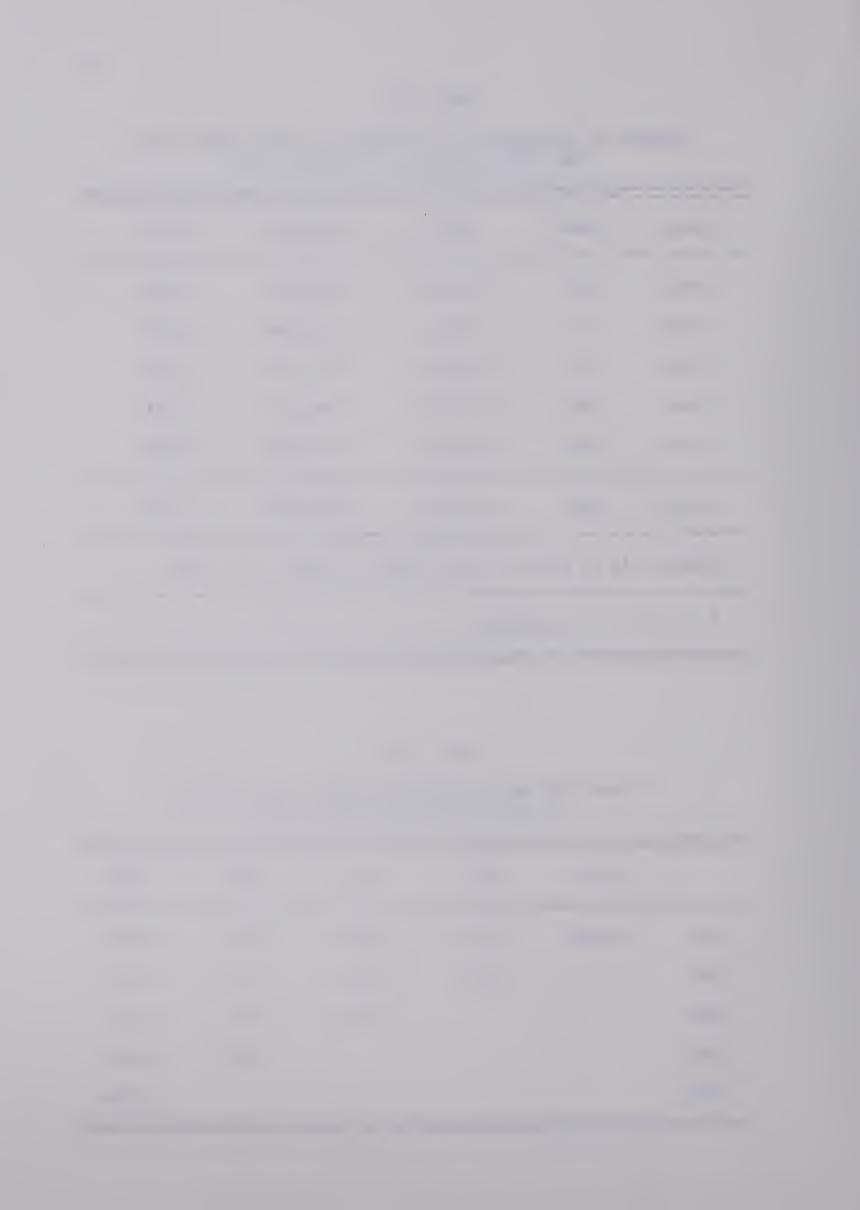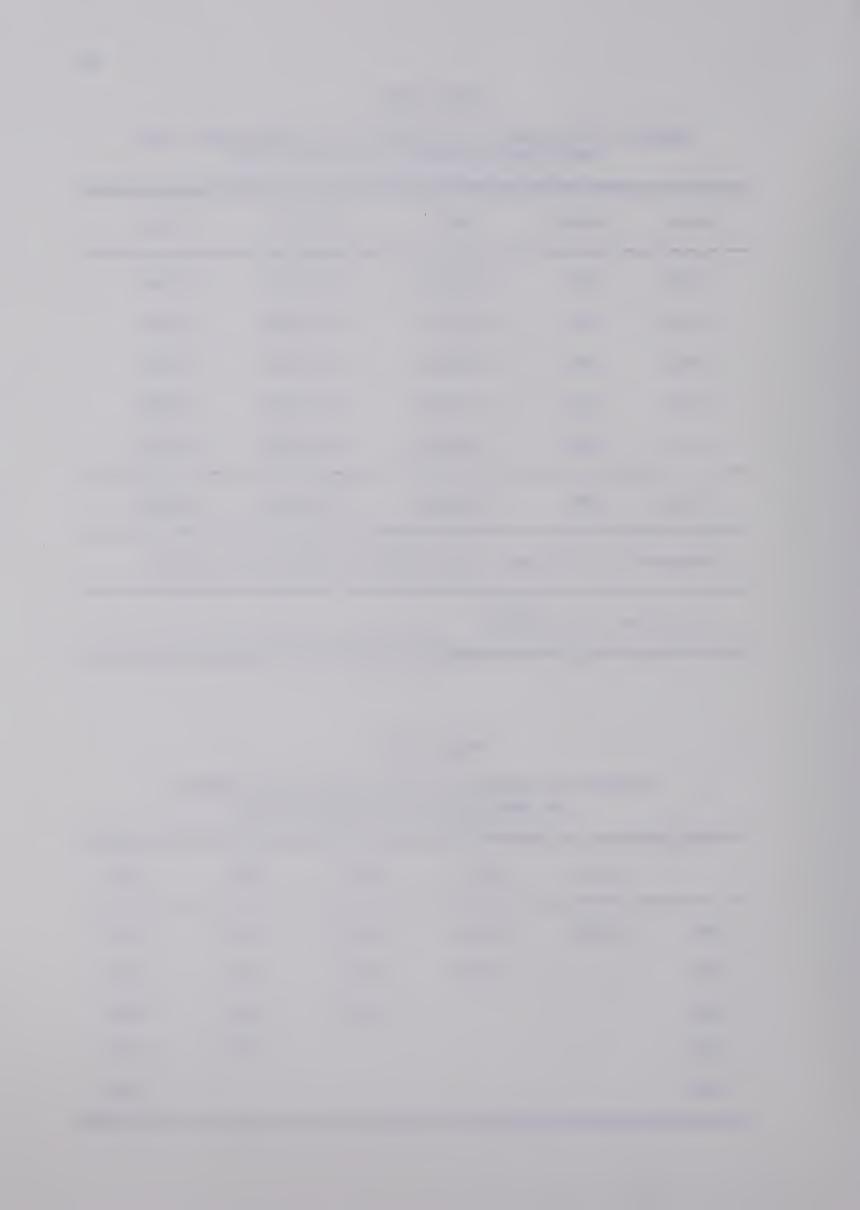|	1960	1962	1964	1966	1968
1960	1.0000	0.3471	0.0000	0.0000	0.0069
1962		1.0000	0.0028	0.0202	0.5657
1964			1.0000	0.9787	0.3000
1966				1.0000	0.6407
1968					1.0000

TABLE LXXXVI

SUMMARY OF THE ANALYSIS OF VARIANCE OF THREE-COUNTY BOYS'
TOTAL RAW SCORES ON FORM B OF THE SCAT TEST

Group	Number	Mean	Variance	S. Dev.
1959	241	63.1826	308.3760	17.5606
1961	251	64.0438	343.1152	18.5234
1963	236	68.0890	317.3020	17.8130
1965	240	73.4542	302.5522	17.3940
1967	227	74.9515	1465.1548	38.2773
Totals	1195	68.6310	556.4375	23.5889

Homogeneity of Variance Test CHISQ = 276.2617; P = 0.0000

F = 12.67; P = 0.000019

TABLE LXXXVII

PROBABILITY MATRIX FOR SCHEFFE MULTIPLE COMPARISON
OF MEANS FOR DATA IN TABLE LXXXVI

	1959	1961	1963	1965	1967
1959	1.0000	0.9966	0.2533	0.0001	0.0000
1961		1.0000	0.4464	0.0005	0.0001
1963			1.0000	0.1725	0.0382
1965				1.0000	0.9746
1967					1.0000

TABLE LXXXVIII

SUMMARY OF THE ANALYSIS OF VARIANCE OF THREE-COUNTY GIRLS'
TOTAL RAW SCORES ON FORM A OF THE SCAT TEST

Group	Number	Mean	Variance	S. Dev.
1960	237	61.4473	340.0293	18.4399
1962	249	66.1968	254.3952	15.9498
1964	254	70.3937	280.4426	16.7464
1966	220	69.0136	297.2029	17.2396
1968	236	67.6907	362.8042	19.0474
Totals	1196	66.9599	314.4062	17.7315

Homogeneity of Variance Test CHISQ = 9.9637; P = 0.0410

F = 9.31; P = 0.000027

TABLE LXXXIX

PROBABILITY MATRIX FOR SCHEFFE MULTIPLE COMPARISON
OF MEANS FOR DATA IN TABLE LXXXVIII

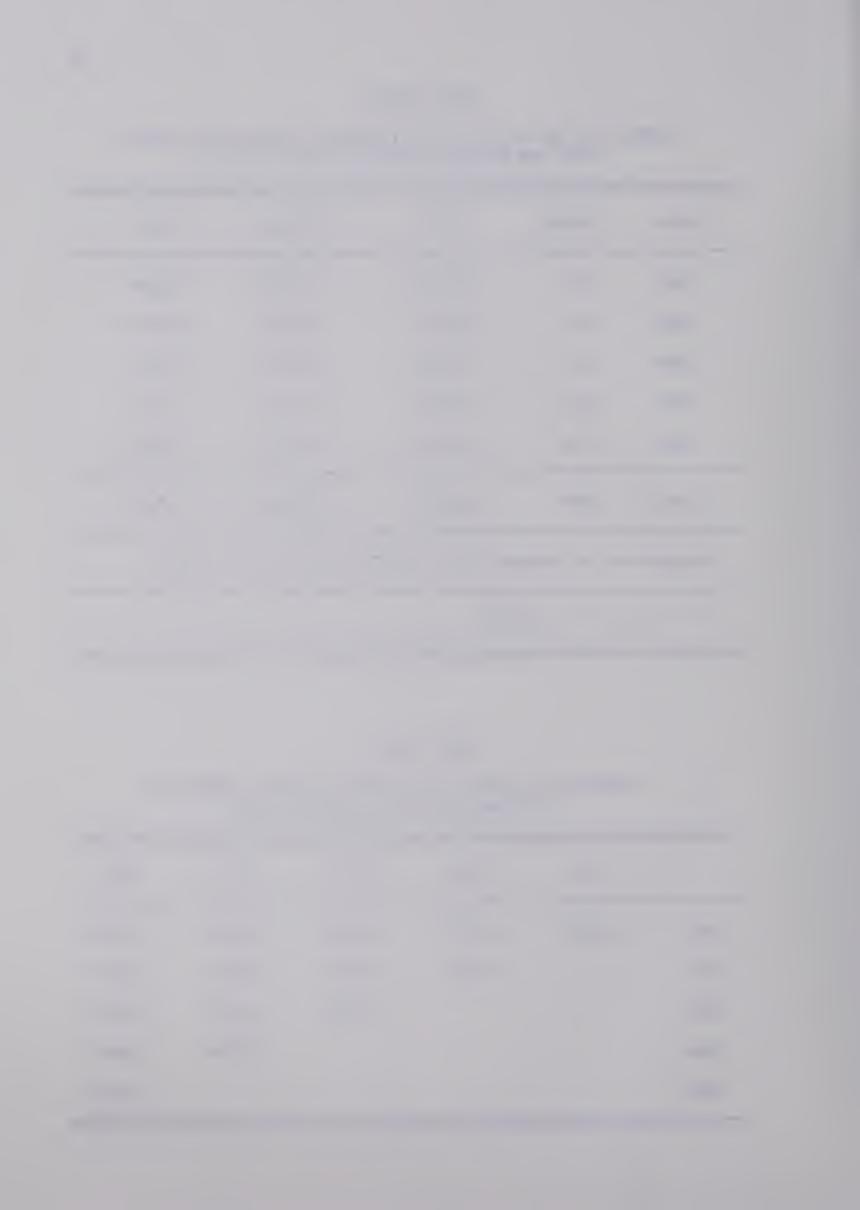|	1960	1962	1964	1966	1968
1960	1.0000	0.0630	0.0000	0.0003	0.0048
1962		1.0000	0.1247	0.5534	0.9268
1964			1.0000	0.9470	0.5715
1966				1.0000	0.9571
1968					1.0000

TABLE XC

SUMMARY OF THE ANALYSIS OF VARIANCE OF THREE-COUNTY GIRLS'
TOTAL RAW SCORES ON FORM B OF THE SCAT TEST

Group	Number	Mean	Variance	S. Dev.
1959	252	63.2222	365.1394	19.1086
1961	249	66.6145	302.8950	17.4039
1963	246	67.6423	307.6692	17.5405
1965	235	73.3787	368.3503	19.1924
1967	231	71.8615	356.2000	18.8732
Totals	1213	68.4279	351.6445	18.7522

Homogeneity of Variance Test CHISQ = 4.4536; P = 0.3481

F = 11.99; P = 0.000021

TABLE XCI

PROBABILITY MATRIX FOR SCHEFFE MULTIPLE COMPARISON
OF MEANS FOR DATA IN TABLE XC

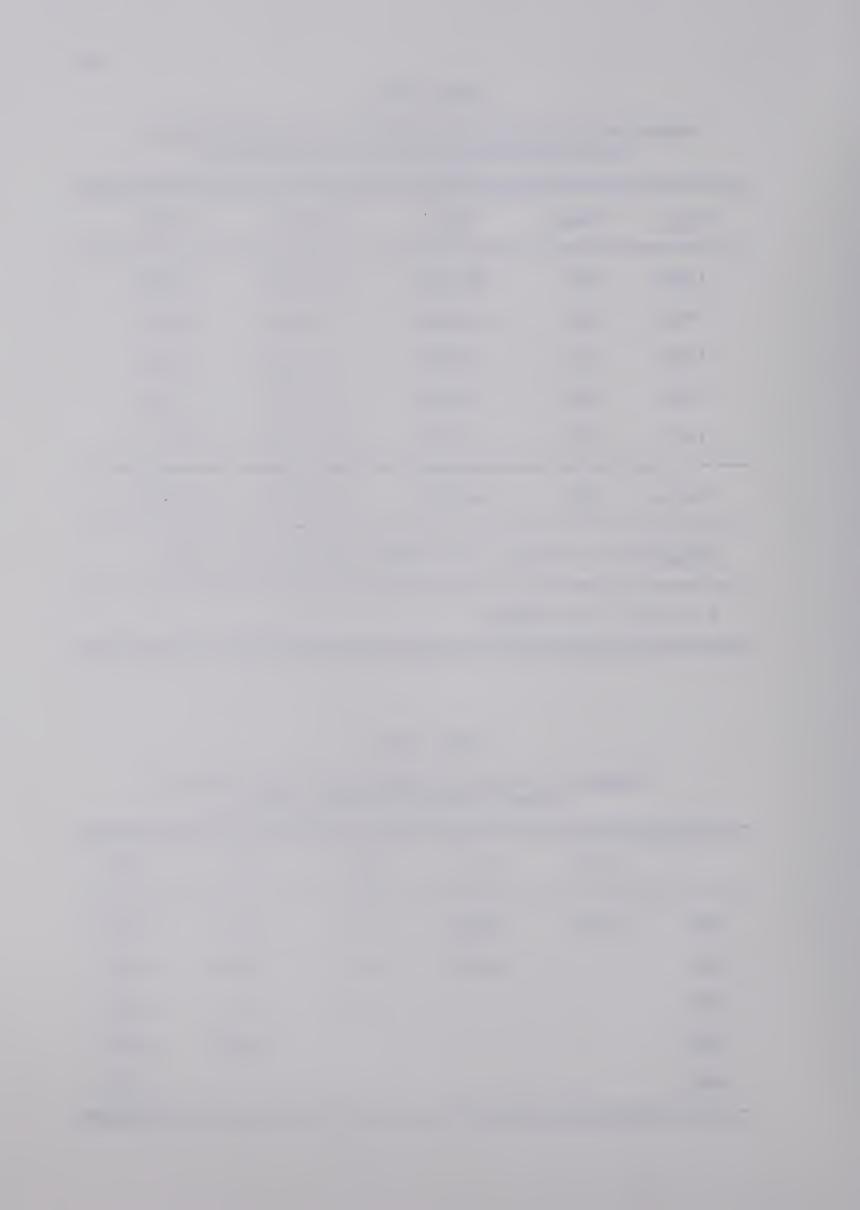|	1959	1961	1963	1965	1967
1959	1.0000	0.3744	0.1283	0.0000	0.0000
1961		1.0000	0.9836	0.0028	0.0460
1963			1.0000	0.0206	0.1823
1965				1.0000	0.9397
1967					1.0000

TABLE XCII

SUMMARY OF THE ANALYSIS OF VARIANCE OF COUNTY 1 TOTAL RAW
SCORES ON FORM A OF THE SCAT TEST

Group	Number	Mean	Variance	S. Dev.
1960	169	60.6331	306.4021	17.5043
1962	200	65.3900	242.6024	15.5757
1964	185	72.5027	318.8833	17.8573
1966	168	72.6845	243.7650	15.6130
1968	155	68.7032	312.7710	17.6853
Totals	877	67.9567	302.5664	17.3944

Homogeneity of Variance Test CHISQ = 6.7033; P = 0.1524

F = 15.91; P = 0.000009

TABLE XCIII

PROBABILITY MATRIX FOR SCHEFFE MULTIPLE COMPARISON
OF MEANS FOR DATA IN TABLE XCII

	1960	1962	1964	1966	1968
1960	1.0000	0.1215	0.0000	0.0000	0.0010
1962		1.0000	0.0019	0.0020	0.4967
1964			1.0000	1.0000	0.3684
1966				1.0000	0.3684
1968					1.0000

TABLE XCIV

SUMMARY OF THE ANALYSIS OF VARIANCE OF COUNTY 1 TOTAL RAW
SCORES ON FORM B OF THE SCAT TEST

Group	Number	Mean	Variance	S. Dev.
1959	175	62.4400	279.6411	16.7225
1961	208	65.5913	253.4136	15.9190
1963	198	67.2929	340.4231	18.4505
1965	188	75.2713	286.7166	16.9327
1967	151	78.3907	2042.7896	45.1972
Totals	920	69.4370	607.9023	24.6557

Homogeneity of Variance Test CHISQ = 341.1389; P = 0.0000

F = 13.45; P = 0.000009

TABLE XCV

PROBABILITY MATRIX FOR SCHEFFE MULTIPLE COMPARISON
OF MEANS FOR DATA IN TABLE XCIV

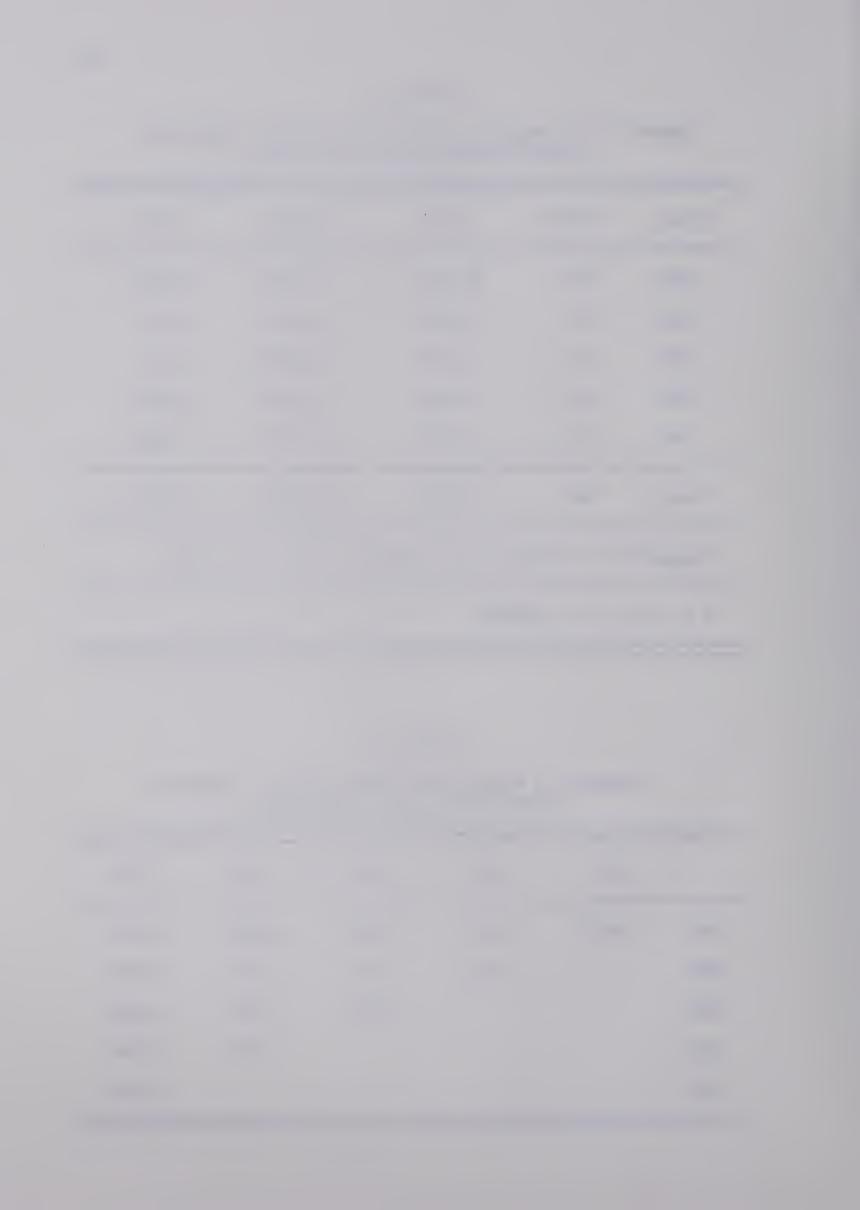|	1959	1961	1963	1965	1967
1959	1.0000	0.8024	0.4357	0.0001	0.0000
1961		1.0000	0.9725	0.0031	0.0001
1963			1.0000	0.0316	0.0012
1965				1.0000	0.8421
1967					1.0000

TABLE XCVI

SUMMARY OF THE ANALYSIS OF VARIANCE OF COUNTY 2 TOTAL RAW
SCORES ON FORM A OF THE SCAT TEST

Group	Number	Mean	Variance	S. Dev.
1960	129	57.7519	300.7056	17.3409
1962	102	59.6078	299.7288	17.3127
1964	125	67.3040	244.3296	15.6310
1966	114	66.5702	382.2500	19.5512
1968	135	65.1629	357.2446	18.9009
Totals	605	63.3537	329.2134	18.1442

Homogeneity of Variance Test CHISQ = 7.2724; P = 0.1222

$F = 7.14$; $P = 0.000018$

TABLE XCVII

PROBABILITY MATRIX FOR SCHEFFE MULTIPLE COMPARISON
OF MEANS FOR DATA IN TABLE XCVI

	1960	1962	1964	1966	1968
1960	1.0000	0.9608	0.0012	0.0054	0.0229
1962		1.0000	0.0339	0.0847	0.2275
1964			1.0000	0.9987	0.9188
1966				1.0000	0.9835
1968					1.0000

TABLE XCVIII

SUMMARY OF THE ANALYSIS OF VARIANCE OF COUNTY 2 TOTAL RAW
SCORES ON FORM B OF THE SCAT TEST

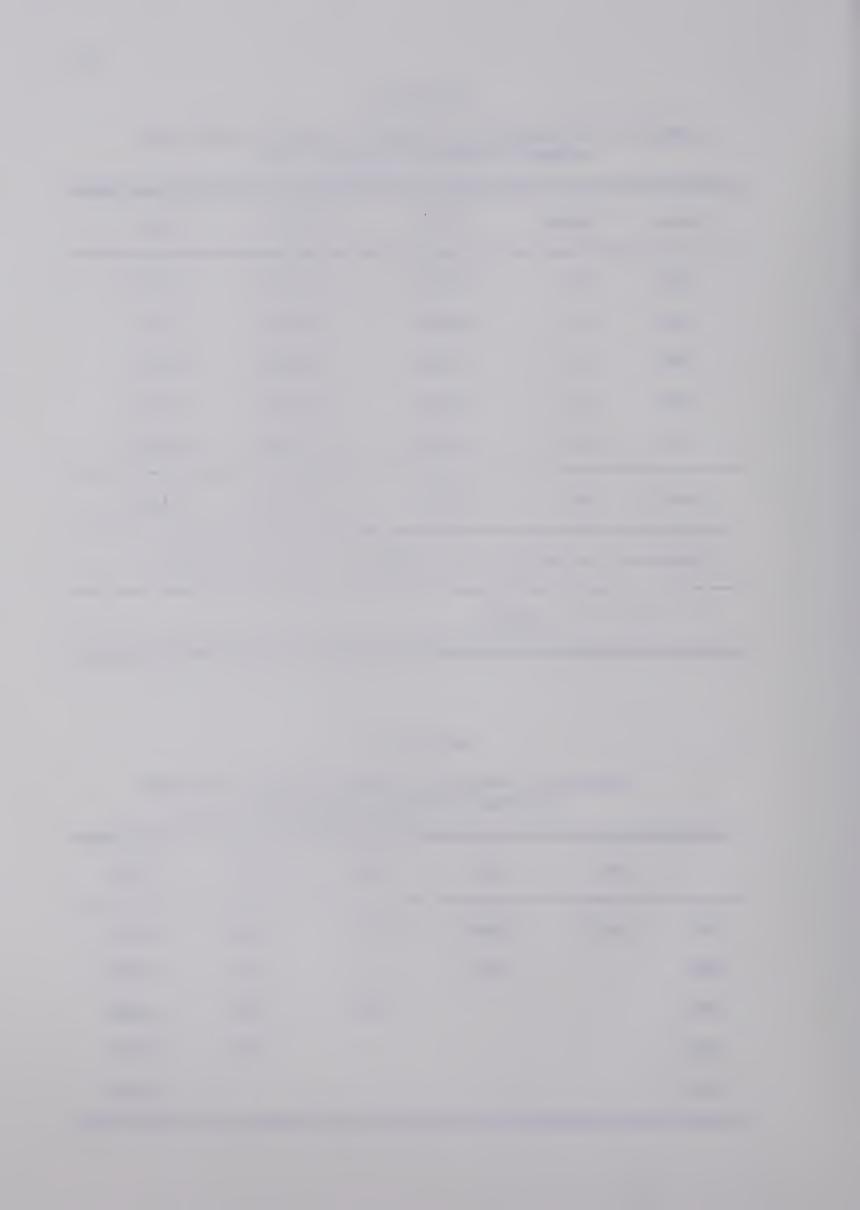| Group	Number	Mean	Variance	S. Dev.
1959	152	59.9013	354.0786	18.8170
1961	128	59.1875	392.2322	19.8048
1963	119	67.4790	310.6440	17.6251
1965	124	70.4113	353.5476	18.8029
1976	122	70.0492	334.2974	18.2838
Totals	645	65.0977	371.4961	19.2742

Homogeneity of Variance Test CHISQ = 1.7993; P = 0.7726

F = 11.25; P = 0.000013

TABLE XCIX

PROBABILITY MATRIX FOR SCHEFFE MULTIPLE COMPARISON
OF MEANS FOR DATA IN TABLE XCVIII

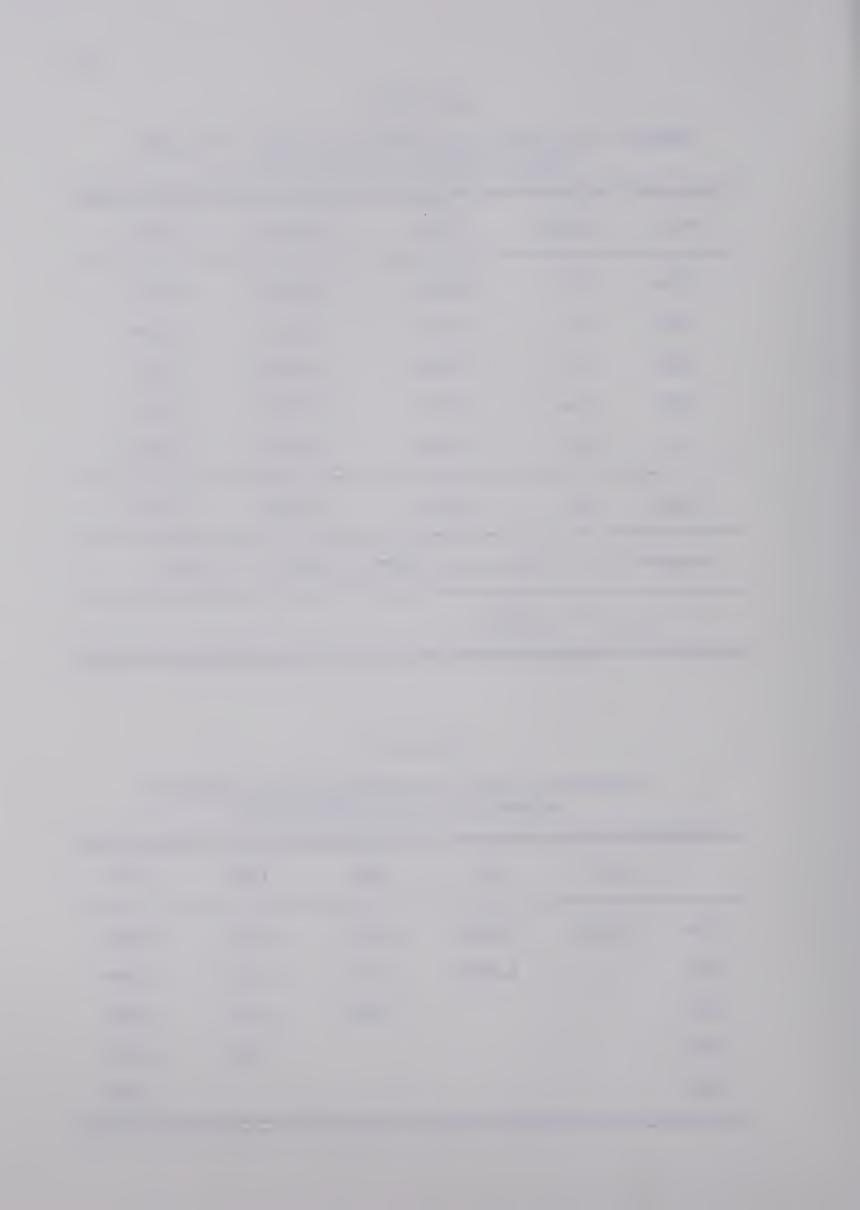|	1959	1961	1963	1965	1967
1959	1.0000	0.9988	0.0279	0.0003	0.0006
1961		1.0000	0.0172	0.0002	0.0004
1963			1.0000	0.8278	0.8881
1965				1.0000	0.9999
1967					1.0000

TABLE C

SUMMARY OF THE ANALYSIS OF VARIANCE OF COUNTY 3 TOTAL RAW
SCORES ON FORM A OF THE SCAT TEST

Group	Number	Mean	Variance	S. Dev.
1960	160	62.4937	310.1401	17.6108
1962	169	66.6864	235.6711	15.3516
1964	161	68.9193	257.4395	16.0449
1966	167	65.9461	262.8962	16.2141
1968	144	66.1667	360.6738	18.9914
Totals	801	66.0499	285.5586	16.8985

Homogeneity of Variance Test CHISQ = 9.0163; P = 0.0607

F = 3.02; P = 0.017247

TABLE CI

PROBABILITY MATRIX FOR SCHEFFE MULTIPLE COMPARISON
OF MEANS FOR DATA IN TABLE C

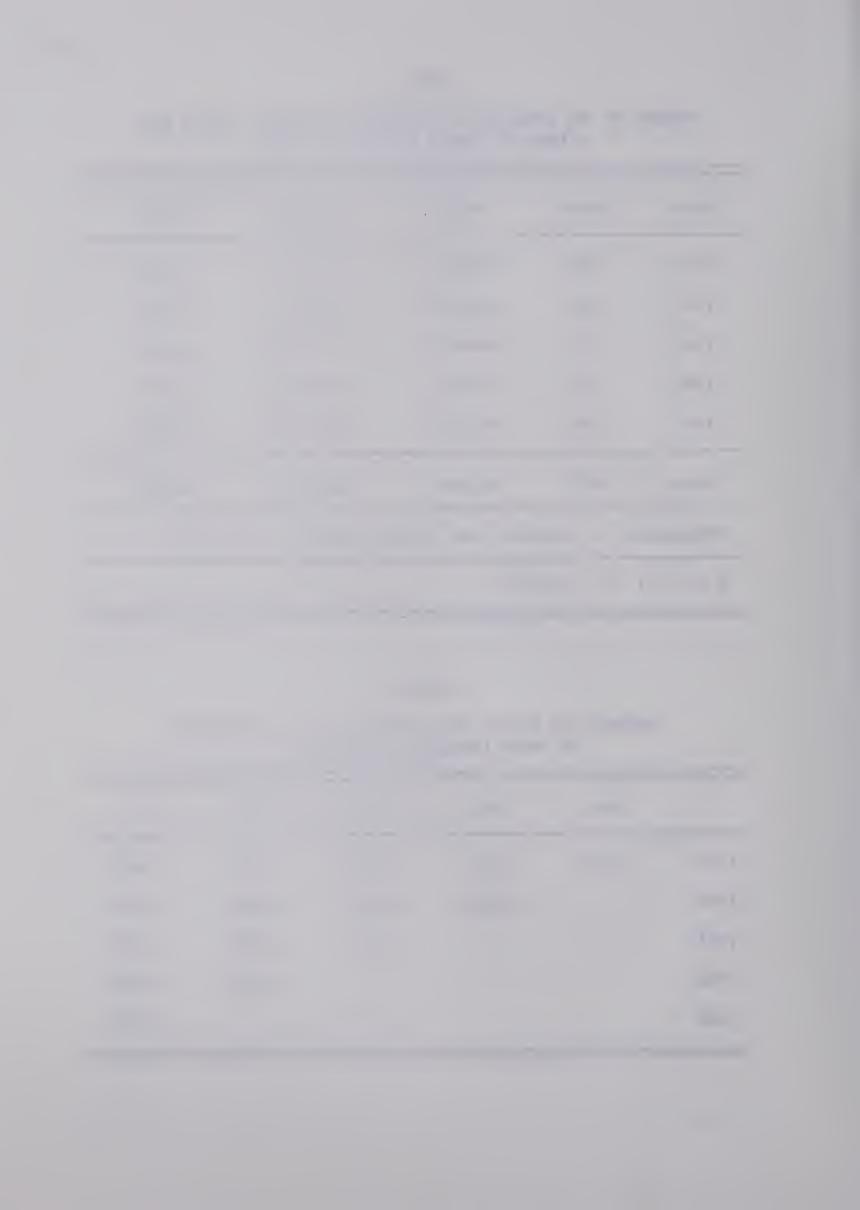|	1960	1962	1964	1966	1968
1960	1.0000	0.2777	0.0203	0.4874	0.4615
1962		1.0000	0.8349	0.9968	0.9993
1964			1.0000	0.6340	0.7293
1966				1.0000	1.0000
1968					1.0000

TABLE CII

SUMMARY OF THE ANALYSIS OF VARIANCE OF COUNTY 3 TOTAL RAW
SCORES ON FORM B OF THE SCAT TEST

Group	Number	Mean	Variance	S. Dev.
1959	166	67.0301	359.6807	18.9652
1961	164	69.7744	315.1475	17.7524
1963	165	68.8182	280.5911	16.7508
1965	163	73.5644	368.1018	19.1860
1967	185	71.5189	334.1885	18.2808
Totals	843	70.1625	334.5625	18.2910

Homogeneity of Variance Test CHISQ = 3.8463; P = 0.4272

F = 3.15; P = 0.013900

TABLE CIII

PROBABILITY MATRIX FOR SCHEFFE MULTIPLE COMPARISON
OF MEANS FOR DATA IN TABLE CII

	1959	1961	1963	1965	1967
1959	1.0000	0.7589	0.9386	0.0323	0.2572
1961		1.0000	0.9940	0.4720	0.9386
1963			1.0000	0.2345	0.7507
1965				1.0000	0.8952
1967					1.0000